

Although “Kamma” and “Rebirth” as views motivates one to do good, that is not the only reason or the best reason, accordingly to the - Nikayas, for leading a good life. "Kamma and Rebirth ethics" is "punishment and reward ethics" which is immature and self centred. The more mature form of ethics is based on a consideration for others and an interest in others welfare and happiness:

*"All beings tremble at punishment  
To all beings life is dear  
Comparing others with oneself  
Hurt not, nor destroy"*

(Dhammapada)

This idea is further elaborated in the Sutras and has been termed the “self refl exive” method of teaching (attupanaikam Dhammapariyayam). This is also the Christian Golden Rule:

*"Do unto others as you would have others do unto you."*

This mature ethic is based on "Metta" or universal benevolence, analogous to Christian love. *"Love thy neighbour as thy self"*; though 'metta' is broader in scope, in being extended to all beings: “May all beings be well and happy” (*sabbe satta bhavantu sukhi tatta*).

# Mind, Matter, and Experience

The Parallels in Analysis  
The Original Teachings of the Buddha  
&  
Neuroscientists and Physicists  
Recent Discoveries

Our Evolving Brain

Cognitive Process

Analyzing the Subjective Experience

Analyzing the Object Experience

The Learning Brain

Evolution of the Human Brain

Charles Darwin: The Great Transformation

*The Key Instigator of Anger: Amygdala*

*Atoms, Molecules, Quarks, Energy*

# **BUDDHISM AS A PSYCHOLOGY**



## **CONSCIOUSNESS: The Subjective Experience**



**Ven. Dr M. Punnaji Maha Thera**

3<sup>RD</sup> OCTOBER 2011

[WWW.BHANTEPUNNAJI.COM](http://WWW.BHANTEPUNNAJI.COM)

Today we are going to be able to understand what we have been discussing, so far in a picturesque way that means we have been missing our friend Billy Tan. We had two sessions where we didn't have him, so we were not able to see anything, interesting things and pictures. So today most of our time will be spent on that, pictures because he has been away for about three weeks. And to compensate for that and also because I had been sick for some time, and so that I will have less work to do, and we will be seeing it, and he will also be able to describe these things, and we are going to start with what we have been saying.

To start with we have to start with the assumption that we are Organisms in an Environment that's the main thing. We see ourselves not as even Human Beings; we have to see that we are Organisms. Now every Plant is an Organism, every Animal is an Organism, and Human Beings are also Organisms. And it is through a gradual Process of Evolution that the Human Being was born with a more developed brain, and the special part of the brain called the Cerebrum, which is doing the thinking. So all our thinking is even in an ancient Indian words; this is I think a Sanskrit words, where it says:

*Ahara nidra bhaya maitunanca  
Samanya me tad pasubih samanah  
Dharmohi tesā madiko viseso  
Dharmena hinah pasubuh samānah*

Feeding, sleeping, fear and sex  
Is common to both man and beast  
Cognition does make man very special  
When low in cognition man is a beast

Now what that means is taking food; "Ahara" means taking food. "nidra" means sleeping. "bhaya" means fear. "maitunanca" means sexual activities. Now these are things that human beings have in common with animals; animals also eat, take food; they also sleep; they are also frightened, and they also have sexual activities. So you see and then it says, "Ahara nidra bhaya maitunanca, Samanya me tad pasubih samanah, Dharmohi tesā madiko viseso," that means, there "Dharmena" means this ability to think and reason out, that is what makes the human being special beyond other animals, and that is because so that more developed brain, which is especially the Cerebrum, the larger part of our brain means the Cerebrum. So you see this in pictures today; you don't have to be just imagining things; you see this in pictures.

And now research on the brain has even resulted in; the scientists have now found the-they are, they're talking about three stages in the development of the brain during the Process of Evolution. The first level is simply if you take the human brain, there's a part of the human brain called the Brain Stem, Brain Stem. Ah here it is:



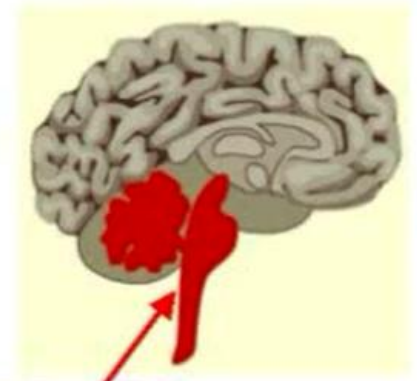
# OUR EVOLVING BRAIN



Our brain evolved over millions of years into **3 main layers**:

## **1. Brain Stem** (*"Lizard Brain"*):

- Most primitive part formed at the top of the spinal chord – it governs autonomic (involuntary) physiological functions such as heart-rate, respiration, digestion, blood pressure, etc. **to keep us alive;**



**BRAIN STEM**  
**"Reptilian Brain"**

Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

The Brain Stem, the red part is the Brain Stem, and then that part of the brain is called the Lizard Brain that means the lizards have only that much. If you take the brain of a lizard, the lizard will only have that much.

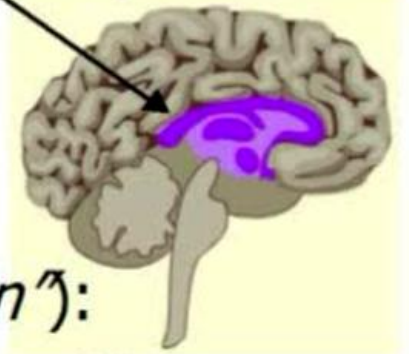
Then there is another part of the brain which is called the Limbic System.



# OUR EVOLVING BRAIN



LIMBIC SYSTEM  
"Emotional Brain"



## 2. Limbic System ("*Leopard Brain*"):

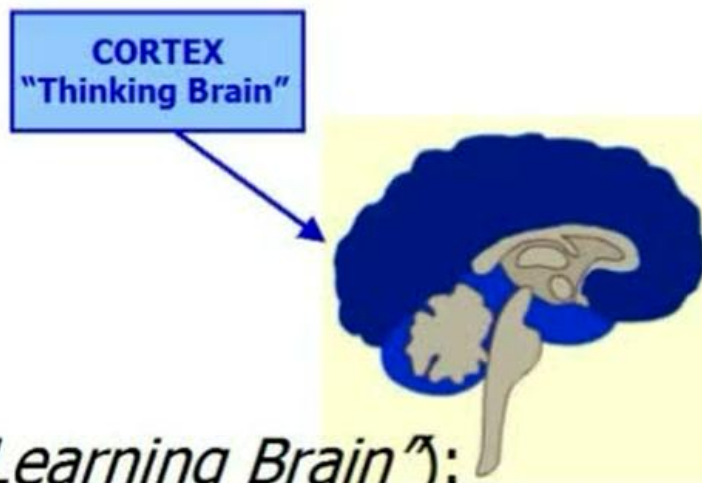
- Middle layer relaying sensory information, memory, emotional arousal, and unconscious emotional reactions – our **emotional command center**;

That purple area is the Limbic System, and that area that is called the Leopard Brain. So the leopards have only in addition to the Brain Stem, they have this part also, that is the Leopard Brain.

It is when you come to the human being that you have that other area called the Cerebral Cortex, the Cerebrum.



# OUR EVOLVING BRAIN



## 3. Cerebral Cortex ( "Learning Brain" ):

- Newest part processing perceptual awareness, attention system, language, logic, reasoning, **learning & critical thinking**, decision making, goal setting and planning;

Ven. Dr. M. Punnañi Maha Thera

CONSCIOUSNESS (October 2011)

That purple part is the Cerebrum. So you see this is very interesting. And so we have been discussing this earlier, and we have a detailed description of what is going on in the form of "*Viññāṇa, Mano, and Citta*", "*Viññāṇa, Mano, and Citta*". And this also we explained that "*Viññāṇa* refers to the activity of our senses; through the senses, that means the eyes, ears, nose, tongue, and body, we are able to perceive; that perception is "*Viññāṇa*". And then what is perceived is brought to the brain through the nerves: optic nerve, auditory nerve, olfactory nerve, and so on. Those nerves bring the messages from the senses to the brain, and the brain begins to think and reason out and give meaning to what was seen or heard. Now that part is called Cognition.

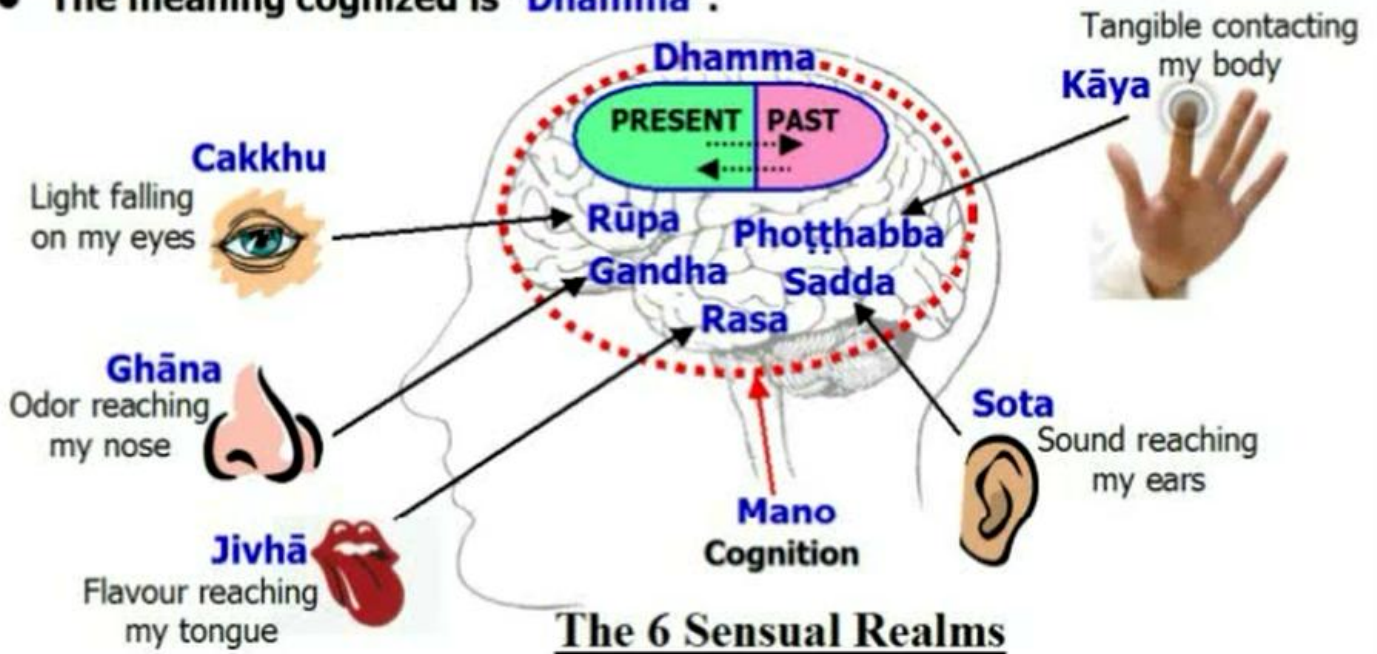




# COGNITIVE PROCESS (Mano)



- Memory represents the Fluid Past organized in a categorized manner;
- Fluid Present refers to the Categorized Fluid Past ("Papanca");
- Giving meaning to & re-cognizing what was perceived ("interpretation");
- The meaning cognized is "Dhamma".



Ven. Dr. M. Punnañi Maha Thera

CONSCIOUSNESS (October 2011)

So that thinking part is the Cognitive Process, where we interpret what was seen or heard or smelt or tasted or touched, and then of course according to our interpretation, according to the interpretation, we react emotionally.



## STIMULUS–REACTION ORGANISM



- The reaction to stimulus is a chain reaction – a series of reactions:
  1. Process of Perception (*Viññāna*)
  2. Cognitive Process (*Mano*)
  3. Affective Process (*Citta*)
    - Normally the organism reacts unconsciously (irrationally) to stimulation from the environment;
    - Emotional Arousal (*Tanḥā*) is the bio-chemical reaction in the organism which gives rise to “tension in the body” which is unpleasant and uncomfortable (*Dukkha*);
    - The organism releases tension in action to overcome the discomfort;
  4. The rational organism delays the reaction, allowing sufficient time to decide (“intention” – *Cetanā*) whether to release the tension in action (negative *Kamma*), or to respond rationally (positive *Kamma*) to the situation;
  5. There are internal and external consequences to every action (*Vipāka*)

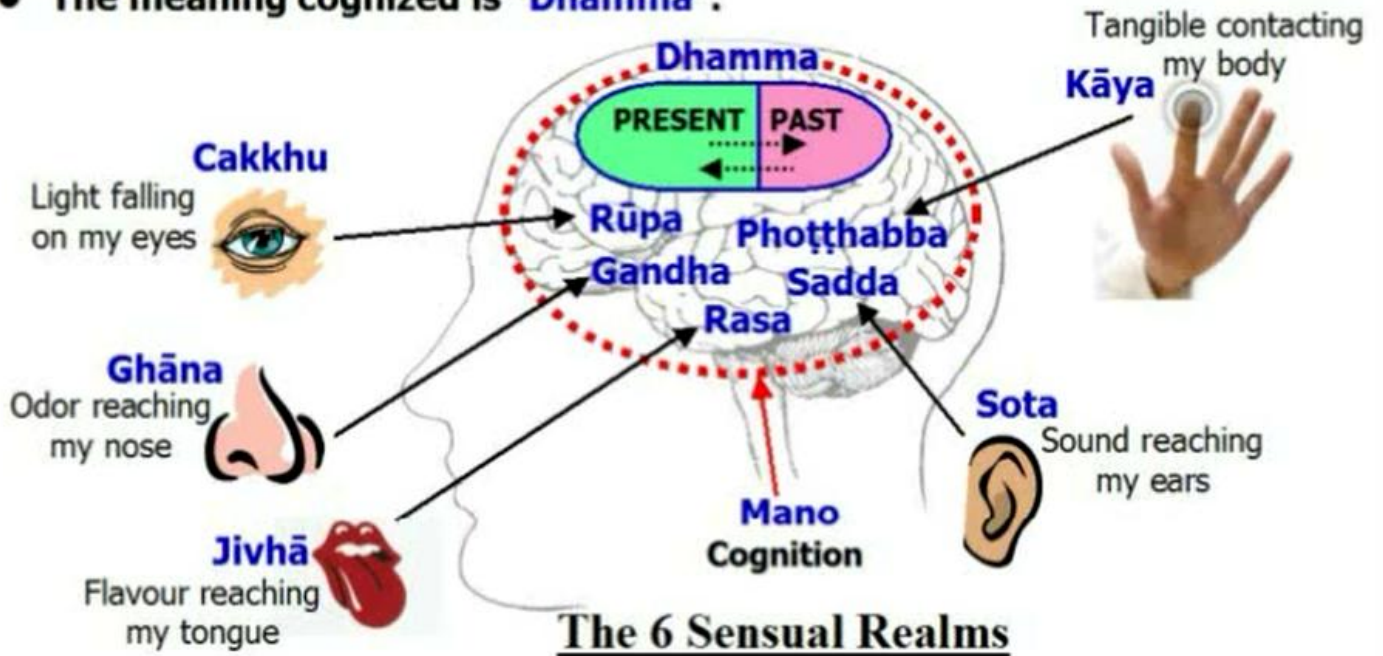
That Emotional Reaction or the Emotional Arousal that part is called, in modern psychology, the Affective. The Cognitive Process and the Affective Process: that is the interpretation. Now in this interpretation we are also bringing out the Memory into use, where we carry things from the Memory and that is how we begin to identify something. Now if I see a ‘cup’, I’m able to say this is a ‘cup’ because I have seen ‘cups’ before, and I’m putting this object that I’m seeing here into that category ‘cup’. So ‘cup’ is the name of a category of percepts.



# COGNITIVE PROCESS (Mano)



- Memory represents the Fluid Past organized in a categorized manner;
- Fluid Present refers to the Categorized Fluid Past ("Papanca");
- Giving meaning to & re-cognizing what was perceived ("interpretation");
- The meaning cognized is "Dhamma".



Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

So that categorization that is in the Pali language called "Papañca". "Papañca" refers to that categorization.



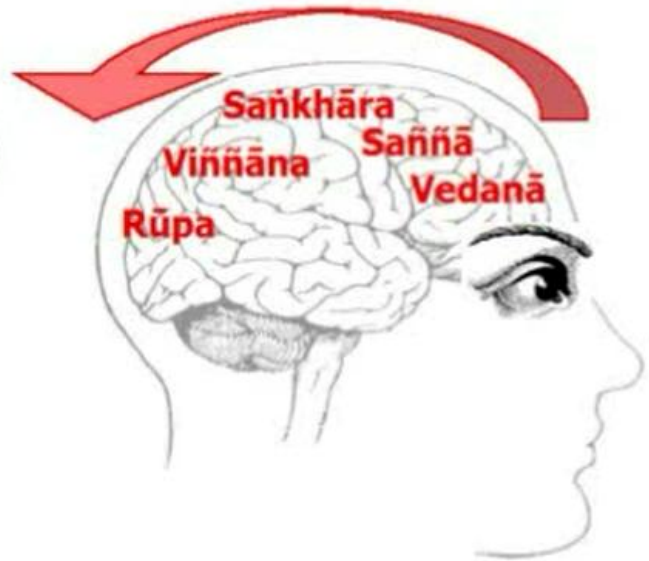
## THE 5 ACCUMULATIONS (Pañca khandha)



### THE 5 ACCUMULATIONS ("the 5 aggregates") :

- Feeling (Vedanā)
- Sensation (Saññā)
- Mental Construction (Saṅkhāra)
- Perception (Viññāna)
- Mental Image (Rupā)

### Process of Perception



Now when we talk about the “*Pañca-Khandha*” which we call; we don't call it Aggregates; we call it Accumulations. Because these are a collection of what we have seen before, and what may be coming after also. All those are put into one lump that is what we have accumulated; we tend to take it and that is how we think of a thing called the Past. Now the Past doesn't exist because it has gone, finished, but still we keep it in Memory, and we are thinking of the Past as if it is still existing, so it is very real to us, the Past.

And maybe we are also thinking of a Future; Future is something that has not even come. It doesn't exist at all. But still we begin to think of it as existing. And if we didn't think of the Past and a Future, we cannot even say we are existing; why? If you think of Present, what is the Present we are talking about? Is it one day or is it one minute or is it one second or is it a fraction of a second we are talking? The Present is becoming the Past every fraction of a second. The Present is becoming the Past, and the Past doesn't exist, so you see if you don't think of the Past and the Present that as if it is real, even the Present is not very real, and we think we are still existing.

Existence is really an illusion: a Delusion.

Now this is the important point to understand, and what we really identify when we think of our Experience, we have two kinds of Experiences: the Subjective and the Objective.

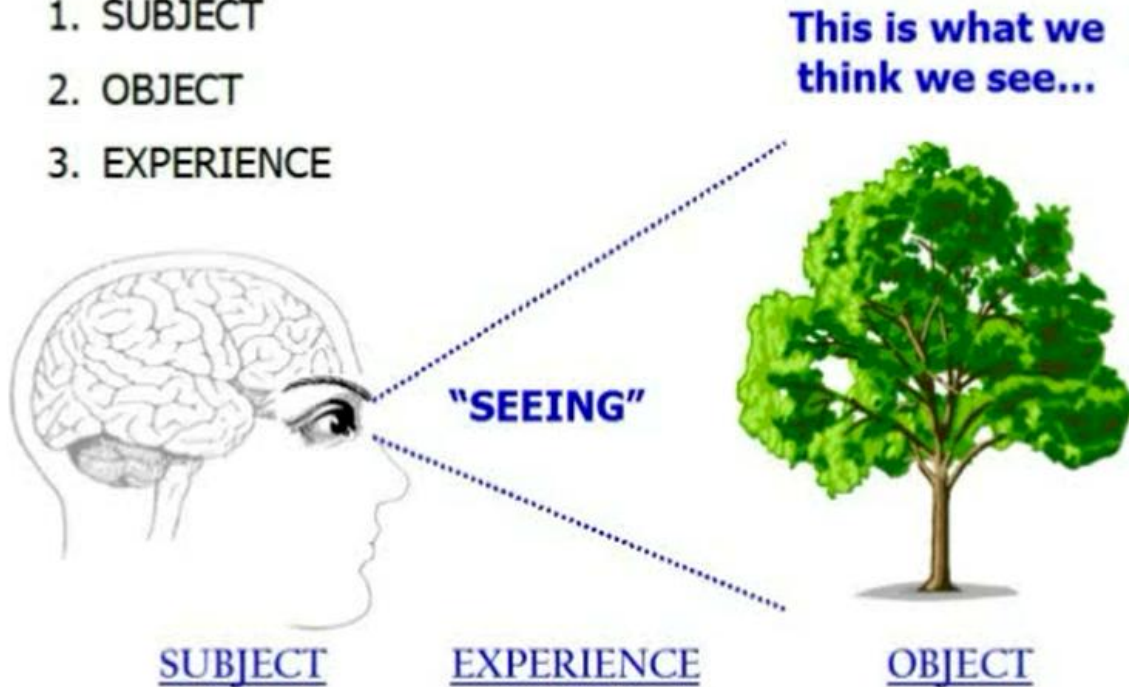


# Sight Consciousness



- There are 3 parts in our consciousness:

1. SUBJECT
2. OBJECT
3. EXPERIENCE



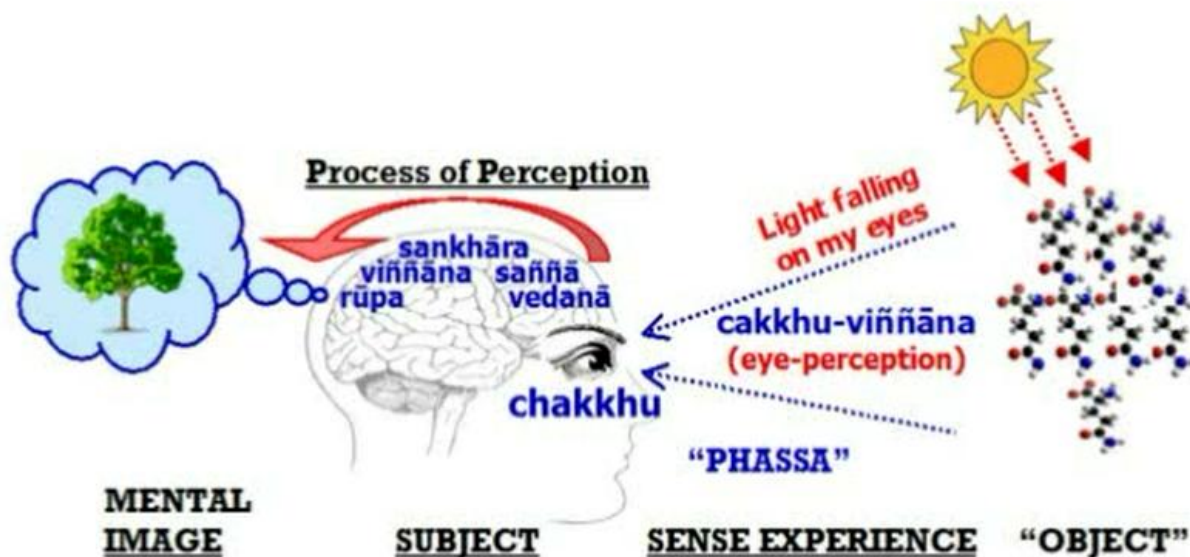
Ven. Dr. M. Punjabi Maha Thera

CONSCIOUSNESS (October 2011)

When we open our eyes and see things, we see as an “Object”, but that “Object” that we see is a result of what we call the Process of Perception.



# Eye-Perception (cakkhu-viññāna)



Ven. Dr. M. Punnañi Maha Thera

CONSCIOUSNESS (October 2011)

It is the Mental Process that is going on, and it is that process that we see something as “Subjective” and what is “Subjective” we begin to Personalize and say this is “Mine” and “My-Self”. So that “Mine” and “My-Self” is the result of Perception and our “Personalizing” the Process of Perception. There's nothing there to call “Mine” and “My-Self”.



# MIND, MATTER & EXPERIENCE



- There is no MATTER and there is no MIND
- There is only EXPERIENCE
- EXPERIENCE is an ACTIVITY
- The activity called "Experience" creates ENTITIES
- The 2 entities we create are the SUBJECTIVE SELF and the OBJECTIVE WORLD
- This brings about the concept of "BEING IN THE WORLD"
- We live under the delusion that there is a SUBJECTIVE MENTAL SELF (**Atta**) and there is an OBJECTIVE MATERIAL WORLD (**Loka**).
- All this is a product of the activity called "EXPERIENCE"
- We can only speak of the ARISING and CESSATION of this ACTIVITY called "EXPERIENCE"

And these are all Accumulations that mean Collections. We have collected the Past, the Present, and the Future. So we this is how we are thinking in terms of the Mind, Matter, and Experience. Now Matter is our Objective Experience, Mind is the Subjective Experience, and when we talk about the Experience, so when we speak of being Conscious, what is the meaning of being Conscious, to be Conscious of a Subjective Experience, to be Conscious of an Object Experience, and to be Conscious of the Experience itself.

So what the Buddha did was to analyze these things, to show that these are all "Empty": the Emptiness





# **ANALYZING THE SUBJECTIVE EXPERIENCE**



Analyzing the Subjective Experience is simply the Reaction to the Stimulus.



## REACTION TO STIMULUS



- Unconscious emotional reaction of the organism to stimulation gives rise to “tension in the body” which is unpleasant and uncomfortable (**Dukkha**)
- This reaction is a chain reaction – a series of reactions:
  1. Perception (**Viññāṇa**)
  2. Cognition (**Mano**)
  3. Emotion – activity of mood / temperament (**Citta**)
    - Emotional Arousal – Intention to React (**Cetanā**)
  4. Release of Tension in Action (**Kamma**)
  5. Consequence of the Reaction (**Vipāka**)

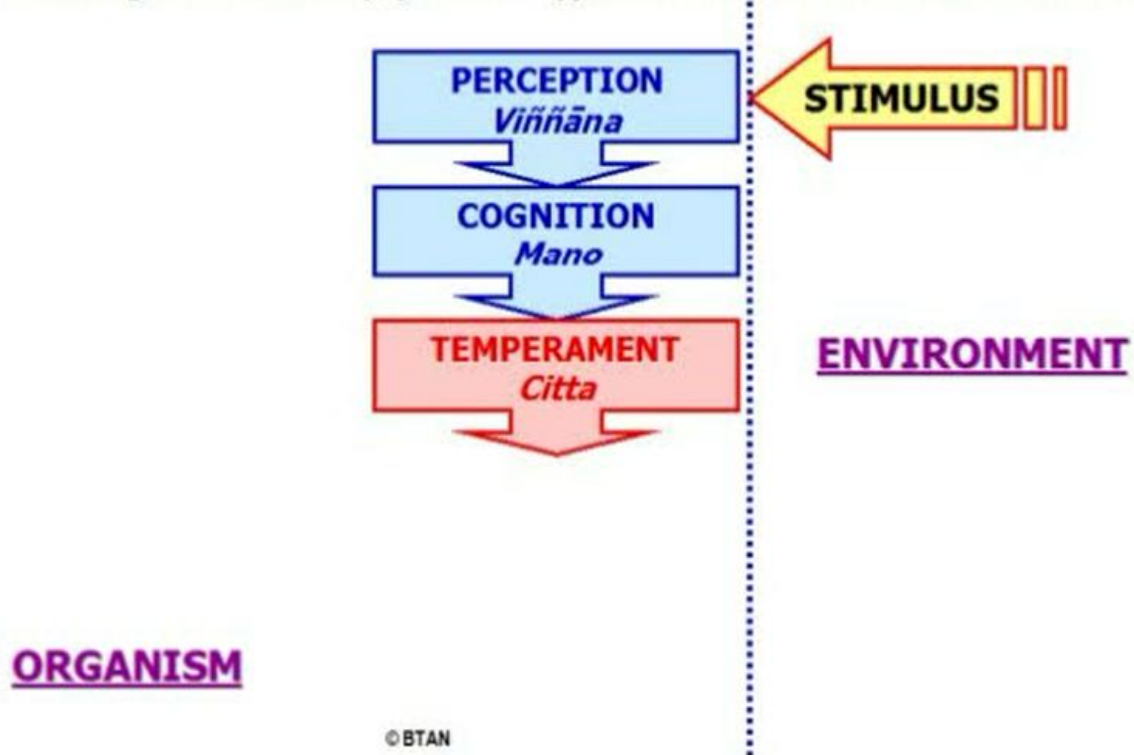
So we already said these days Perception, Cognition, and Emotion, and the Release of Tension in Action, and the Consequence of the Action is the “*Vipāka*”. And so this is what we are talking about all the time: Perception, Cognition, Emotion, and the Release of Tension in Action. When we act that act is really a Release of Tension because we are building up tension when we are emotional excited. Emotional Excitement is the building of tension, and the tension makes you uncomfortable and to get rid of the discomfort you release the tension in Action.



# STIMULUS-REACTION PROCESS



- In an **untrained mind**, we behave as "Stimulus-Reaction" organisms reacting unconsciously (irrationally) to stimulation from the environment:



Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

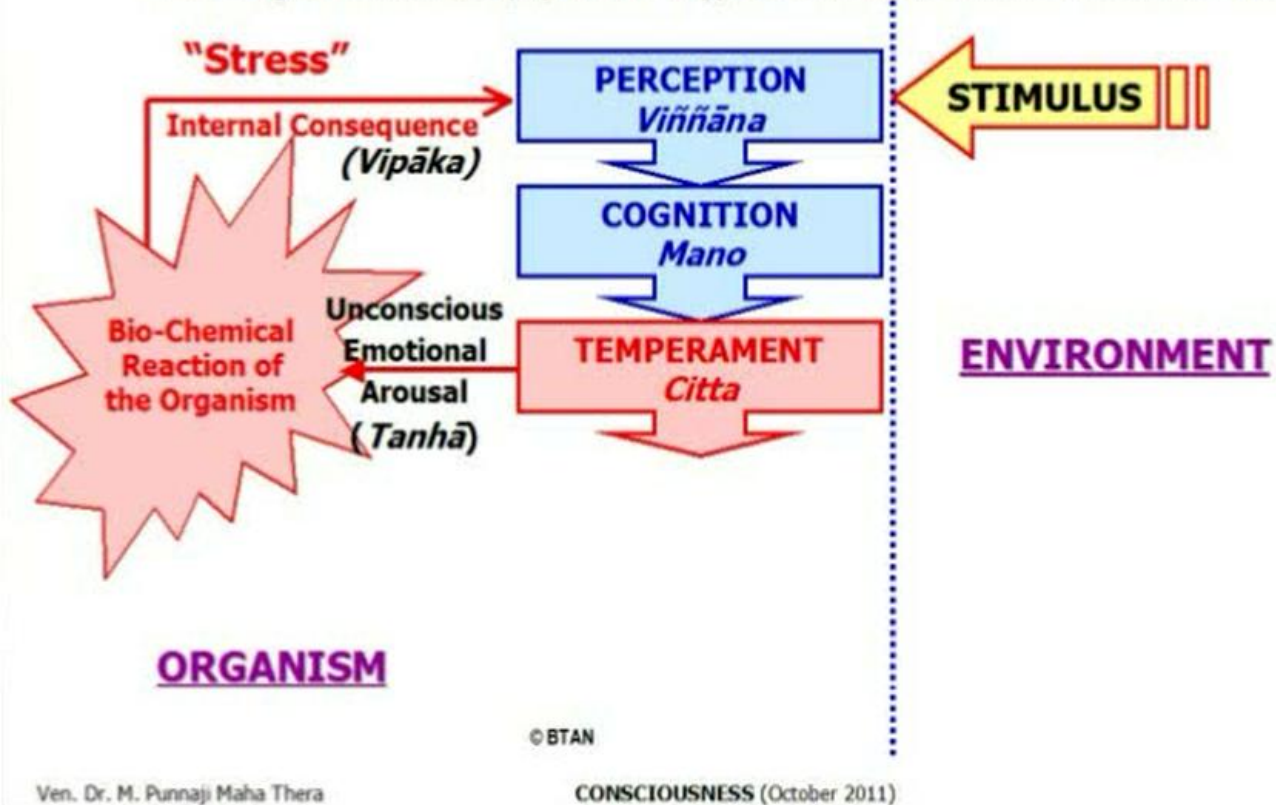
Now here you get the stimulus and the reaction in more detail. So the first step is “*Viññāṇa*”, Perception, the Cognition, and then from Cognition we react and that is the Emotional Arousal, which is happening unconsciously and that is what is called “*Taṇhā*”.



# STIMULUS-REACTION PROCESS



- In an **untrained mind**, we behave as “Stimulus-Reaction” organisms reacting unconsciously (irrationally) to stimulation from the environment:



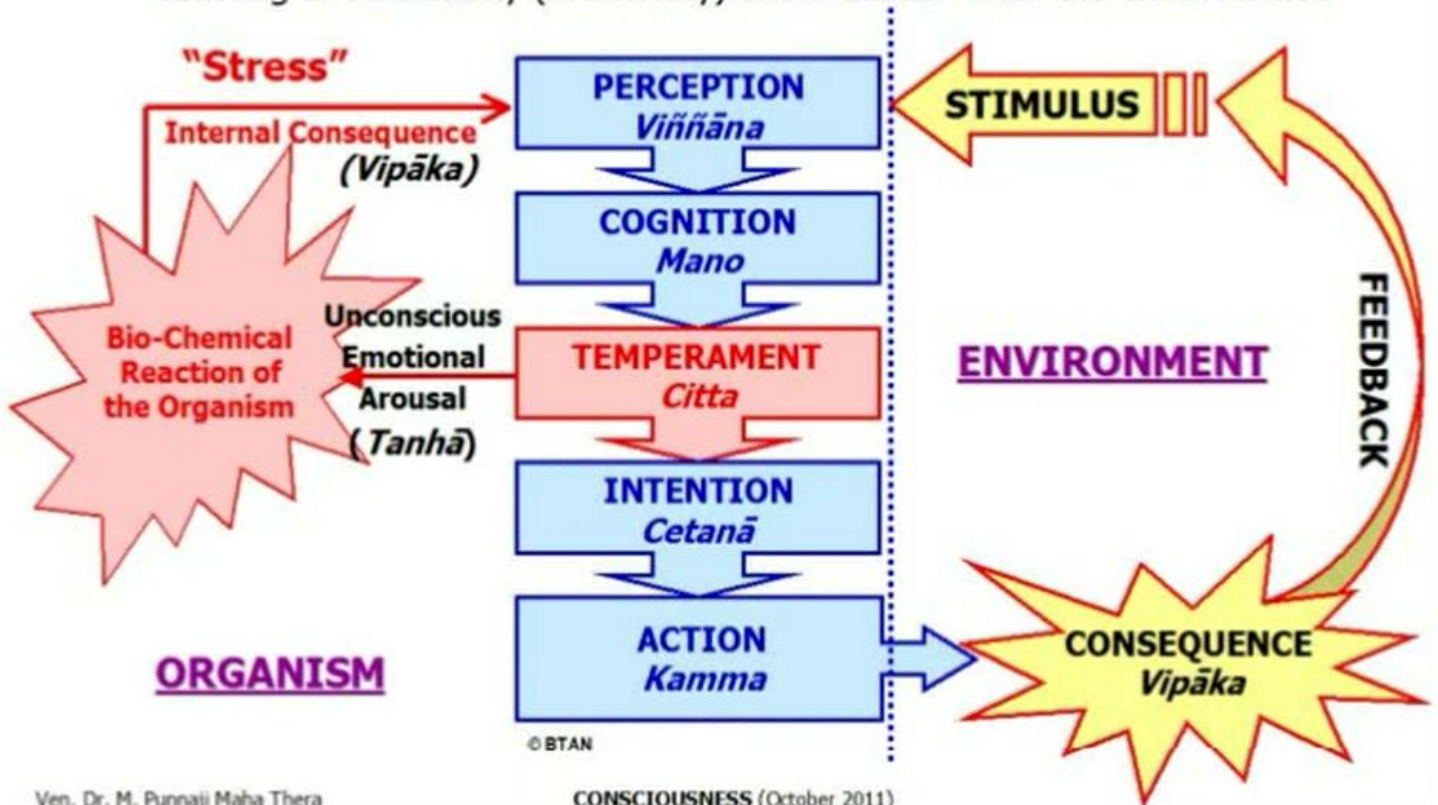
So “*Taṇhā*” really is that Emotional Reaction, and that is what the Buddha saw as the cause of all the suffering, unhappiness: the Emotions. Now this Emotion is really not just a thought; it is a complete, what is called a Biochemical Reaction of the Organism that means the whole body is changing in Behavior when the Emotion is aroused, and that is what today people call “Stress”. So the Stress is really that Biochemical Reaction. Now that is the internal part of the “*Vipāka*” that Emotion is having internal problem which is what is today called Stress.



# STIMULUS-REACTION PROCESS



- In an **untrained mind**, we behave as "Stimulus-Reaction" organisms reacting unconsciously (irrationally) to stimulation from the environment:



Ven. Dr. M. Punnaji Maha Thera

Apart from Stress if we begin to react emotionally by Releasing Tension in Action, then we have other Consequences because if you go and fight with people or quarrel and even murder or do things like that, you'll be taking to prison, and then you'll be giving punishments of different kinds that is also. And the other thing is what happens after death if you're reborn; that rebirth will also will be producing a lot of damage to you. So all that is external; whereas, the stress that is going on inside his internal.

This is why the Buddha points out that if someone does something to you, says something bad, if someone does something to you and if you become angry, what happens? It is like a person shooting at you with one arrow, you are shooting yourself with another arrow. Because becoming angry is to shoot yourself; because you are creating damage inside you, so you're damaging yourself. So this is why it is not wise to be angry whatever happens in the world outside; if you become angry, you are only damaging yourself.

So it's not only Anger that is damaging yourself even other emotions, even an emotion that is normally called love, which is a sexual emotion, even that is damaging. All Emotions are doing the same thing, which is disturbing your whole structure. So it is very important to learn to gain control over our Emotions. This is the main teaching of the Buddha. The main teaching of the Buddha is that.



# **ANALYZING THE OBJECTIVE EXPERIENCE**



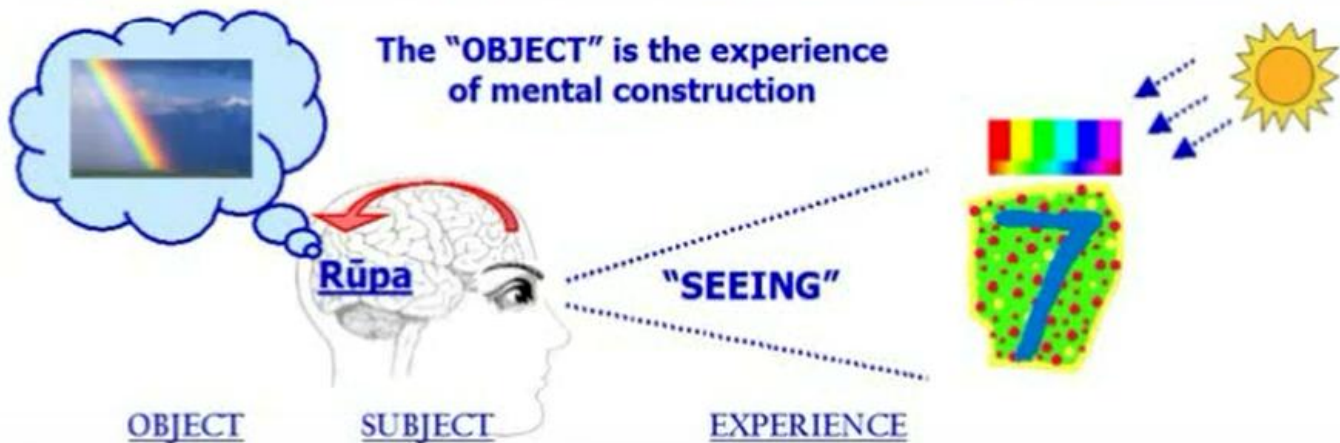
Analyzing the Object Experience; now in analyzing the Object Experienced, the Buddha pointed out, first you should understand what we mean by an Experience.



# "SEEING" A RAINBOW



This is what we think we see:



Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

Experience has three parts: the Subject, the Object, and the Experience. And if we take one example "Seeing" is an Experience, and the Subject is the Eye, the Object is what you "See". If you see the rainbow that becomes the Object, and the Experience is the "Seeing". Seeing becomes the Experience. Now the important thing to understand is that what is really going on is the "Seeing", which is the Experience. The Subject and the Object are creations of the Process of Experiencing. The Object that you see as something "Outside" is really "Inside" your Head. The Object that is seen, but you see it as if it is Outside, but it is really Inside your Head; just your eyes like a camera that take pictures, and the picture is Inside the camera not Outside. So in the same way, everything that we "See" really is "Inside" our Heads; although we think it is "Outside". And the Subjective part is also like that, which is an Experience Inside.





# ANALYZING THE OBJECTIVE EXPERIENCE (**Dhātu**)



**Pathavī dhātu**  
SOLIDITY



**Āpo dhātu**  
FLUIDITY



**Tejo dhātu**  
HEAT



**Vāyo dhātu**  
MOTION



**Ākāsa**  
SPACE



**Viññāṇa**  
PERCEPTION

Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

Now when we analyze the Objective Experience, the Buddha spoke of “*Pathavī-dhātu*”, “*Āpo-dhātu*”, “*Tejo-dhātu*”, “*Vāyo-dhātu*”, “*Ākāsa*”, and “*Viññāṇa*”. “*Pathavī-dhātu*”, “*Āpo-dhātu*”, “*Tejo-dhātu*”, “*Vāyo-dhātu*”, “*Ākāsa*”, and “*Viññāṇa*”.

So “*Pathavī*” refers to the Solidarity, and “*Āpo*” refers to the Fluidity, and “*Tejo*” refers to Heat, and “*Vāyo*” refers to Motion. Now what this means is Solidarity and Fluidity or Solidarity and Liquidity that is really what we call Matter; Matter, of course, today the scientist sees Matter as Solid, Liquid, and Gas, but the ordinary people didn't know about Gas. It is the scientist who brought the idea of thing call Gas. So the Buddha only spoke of these two things Solid and Liquid which is representing Matter.

And Energy there are different kinds of Energy that people are aware: Heat, Light, Sound, Electricity, Magnetism, and Chemical Energy; all those things. But the normal person doesn't know about all those things; the normal person during the Buddha's time knew only about Heat and Motion, so he spoke of only the Heat and the Motion to speak about Energy and Motion.

And then of course “Empty Space” becomes the background, in which you find the Solids, the Liquids, the Heat, and the Motion. The background is the “Empty Space”. And of course if you don't perceive, if the Process of Perception is not there, you will not even be able to see the Solids, Liquids, Heat, or Motion. So without the Process of Perception, those things cannot exist. So this is what the Buddha pointed out. So that is analyzing the Objective Experience.

So analyzing the Subjective Experience was analyzing the Process of Experiencing which is “*Rūpa, Vedanā, Saññā, Saṅkhāra, Viññāṇa*” which was “*Rūpa*” we said was the Mental Image that we see, and all that is really created, the Mental Image is created by the Process of Perception, which comes in the form of “*Vedanā, Saññā, Saṅkhāra, Viññāṇa*”. “*Vedanā*” was the Feeling, whether it is Pleasant, Unpleasant, or Neutral. And “*Saññā*” was the perception, not the perception, Sensation; “*Saññā*” was Sensation, which comes to the “Eye” in the form of Colors and then from the “Eye” we “See” the Colors, and we make use of the Colors to make a Mental Construct. So when we “See” an Object it is really a Mental Construct; we are constructing the Image, and that is the Process of Perception, where we are able to see different “Images”, and we are able to see the differences and the similarities, and even the relationships between one Object and another Object, so all that is creating the Mental Image. So the Mental Image is created by that Process of Perception that is analyzing the Subjective Experience, analyzing the Subject Experience.

Then the Buddha also analyzed the Experience itself in the form of the Eye Experience, the Ear Experience, the Nose Experience, the Tongue Experience, and the Body Experience.



# WHO AM I ?



## ❖ I am an Organism in an Environment



Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

Billy Tan: “Bhante that's next week's lesson.” Bhante: “Huh? What’s that?”  
“That’s next week’s lesson. You’re jumping ahead; there is plenty to show today.” “Okay so any interesting things to show now?” Billy: “Yeah Plenty.”  
“We see them now.” “Shall I begin? Can I start?” Yeah.

Alright let's go back to the beginning. Bhante asked the question, “who am I?” and he mentioned that “I am an Organism in an Environment.”

Now as an Organism in an Environment, two things are happening to us; they are outside of our control, but they're happening to us.



# WHO AM I ?



## ❖ I am an Organism in an Environment

- 1. METABOLISM :**  
**Life sustaining process;**



The first is called Metabolism. Basically this is the life sustaining process that is happening in every single cell in our body.



# WHO AM I ?



## ❖ I am an Organism in an Environment

1. **METABOLISM :**  
Life sustaining process;

2. **CONSCIOUSNESS :**  
Experiencing the  
Environment through  
5 physiological senses;



And collectively these trillions and trillions of cells in the body, undergoing Metabolism, give rise to the next thing that is happening to us call Consciousness. And we Experience the Environment through the Five Physiological Senses.



# WHO AM I ?



## ❖ I am an Organism in an Environment

1. **METABOLISM :**  
Life sustaining process;

2. **CONSCIOUSNESS :**  
Experiencing the  
Environment through  
5 physiological senses;



Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

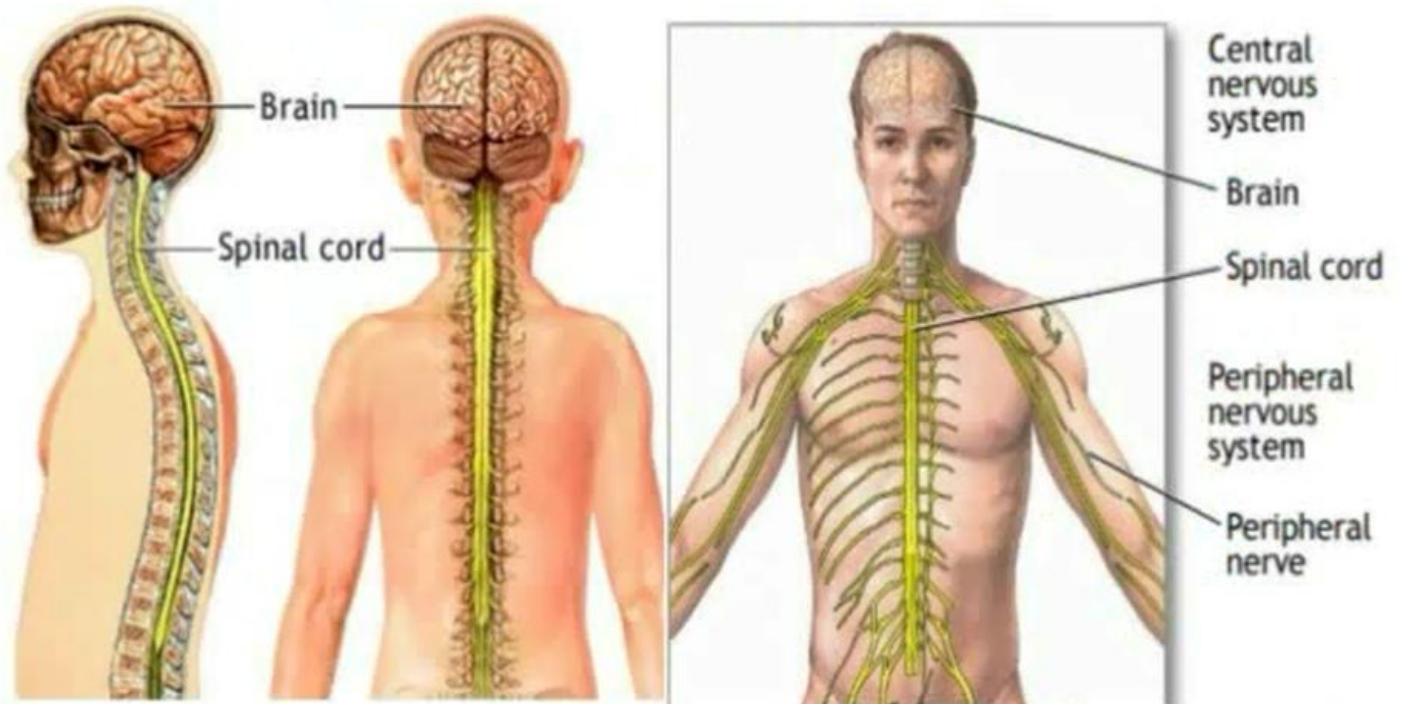
And in today's world the Environment is a very fast-paced, hyperactive Environment, as we witnessed today, even in the first few minutes of Bhante's talk, several phones were ringing. So we are all dealing in a very fast-paced Environment, and we react to it so much we can't even, in the old days when the phone rings at home, we're not home we don't care about it, but today every time the phone rings in our pocket, and we put it out and start talking, regardless of what's going on. So it is a very fast paced Environment we are in.



# CENTRAL NERVOUS SYSTEM



- Our central nervous system:



Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

To deal with this fast-paced Environment, every Human Being is equipped with this Central Nervous System, which is made of two main parts: the Brain and the Spinal Cord. What happens is that everything that's going on around us is being detected and sensed by our Sense Organs and all the Nerve Cells. The Nerves go through the Spinal Cord and feed the Information to our Brain. At the same time the Brain processes all that and sends message to the rest of the body through the Spinal Cord. So that is a Central Nervous System.

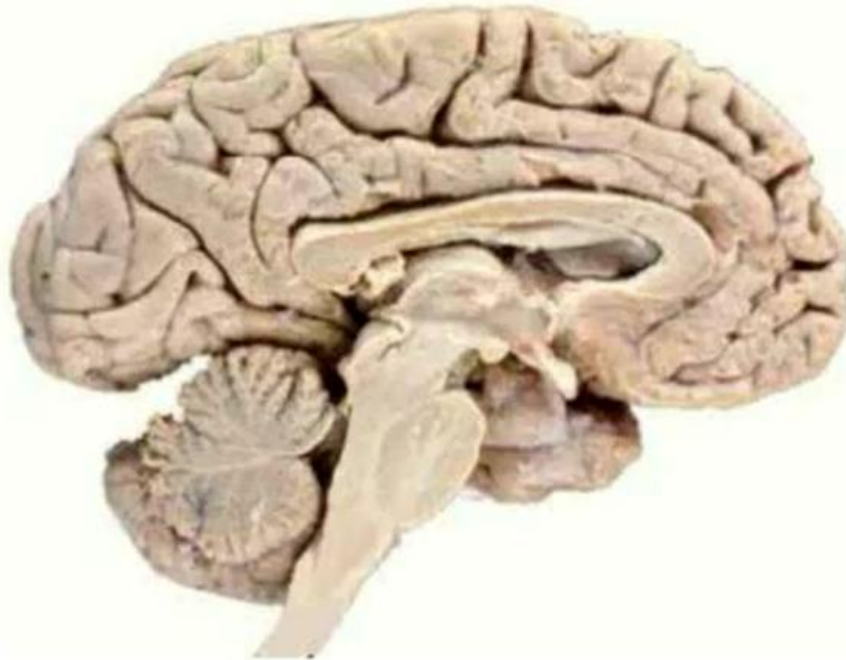
We'll just take a look at the Brain.



## OUR EVOLVING BRAIN



Our brain evolved over millions of years into **3 main layers**:



Ven. Dr. M. Punnaaji Maha Thera

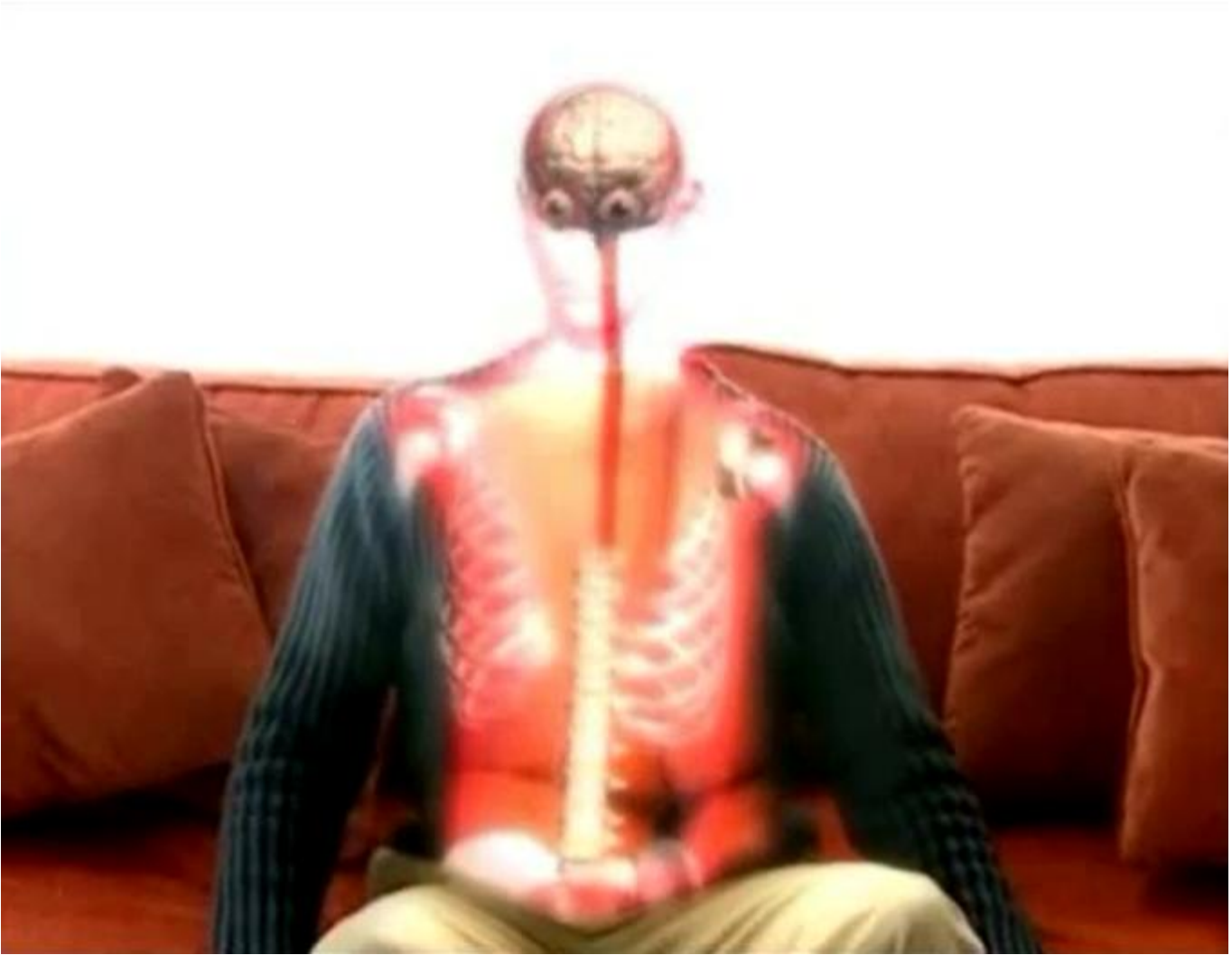
CONSCIOUSNESS (October 2011)

The Brain actually evolved over millions of years, and it all perhaps started by 500 million years ago when ancient creatures started appearing in the oceans, and then they got onto land, and by the time they evolved into Apes, that was about 10, 20 million years ago, and then Apes evolved into Humans around 2 to 3 million years ago. So let's take a look at how the Brain Structure; the Brain actually was formed from the Structure that evolved.





*Right here we have a Human Brain and it's about 3 pounds of massive jelly here that sits at the top of your Spinal Cord.*



*This is basically an extension of the spinal cord that's taking 500 million years to evolve from what used to be just a simple notochord all the way to the modern mass that you see in front of you here.*



*And it's the seed of everything that makes us human: our hopes, our dreams, our desires, our ability to appreciate a Piano Sonata, or to do abstract mathematical calculations.*

*So let's have a look inside and see what makes the human brain special.*



*Ever wondered what was inside your brain. Inside every human brain is a map of how it evolved.*



*So what we have here is now a central view of the brain where we've taken the brain, and we cut it right in half down the middle here, and what you can see here is the evolutionary progression of the brain.*





*The oldest part of the brain, the sort of the fish part of the brain, if you will, is here in the center.*



*And we've also then got the more reptilian portion of the brain, which connects the two hemispheres to each other, and then finally we've got the outer surface of the cortex, the most evolutionarily advanced portion of the brain.*





*The fish part of our brain controls the basic body functions: breathing, eating, moving.*



*The reptile part develops senses, like smell and vision, and handles simple cause and effect.*



*Then the higher mammal portion deals with complex thoughts and emotions and we need them all.*



*Evolution is conservative. You don't throw out a good thing once you've developed it. All of these basic life support functions present in fish and reptile.*



*Once those abilities evolved, Evolution didn't throw them out, it simply layered them on top, from one portion on to the next, from the Fish brain to the Reptilian on up into the modern Human brain.*



# OUR EVOLVING BRAIN



Our brain evolved over millions of years into **3 main layers**:

## **1. Brain Stem** (*"Lizard Brain"*):

- Most primitive part formed at the top of the spinal chord – it governs autonomic (involuntary) physiological functions such as heart-rate, respiration, digestion, blood pressure, etc.

**to keep us alive;**



**BRAIN STEM**  
**"Reptilian Brain"**

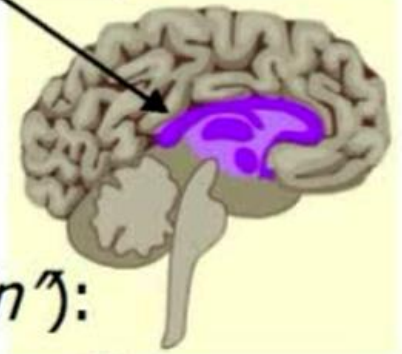
So that's how the brain evolved into three main layers; the most primitive, of course, is at the top end of the Spinal Cord called the Brain Stem. Basically all the functions; they are automatic and involuntary and they keep us alive.



# OUR EVOLVING BRAIN



LIMBIC SYSTEM  
"Emotional Brain"



## 2. Limbic System ("*Leopard Brain*"):

- Middle layer relaying sensory information, memory, emotional arousal, and unconscious emotional reactions – our **emotional command center**;

Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

Then comes the Limbic System which is controlling our memory; it is also relaying sensory information received from the Spinal Cord. So that was all our senses. Whenever we see something, we hear something, this sensory information comes through this part of the brain the Limbic System through a tissue called Thalamus, and it also is responsible for Emotional Arousal as well as unconscious Emotional Reactions. As you can guess basically the Limbic System is our Emotional Command Center.



# OUR EVOLVING BRAIN



CORTEX  
"Thinking Brain"



## 3. Cerebral Cortex ("*Learning Brain*"):

- Newest part processing perceptual awareness, attention system, language, logic, reasoning, **learning & critical thinking**, decision making, goal setting and planning;

Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

We have evolved with the much higher function so the latest addition to the brain is something that evolved about 5 to 6 million years ago when Apes became Human. It is the newest part of the Brain called Cerebral Cortex. There are, if you read the books there are many names do it some people call it Cerebrum, Cerebral Cortex, Lobes. Actually they refer to slightly different parts of it, but it's still the main part of the Brain where it surrounds the Limbic System; it is the outer part that surrounds the Limbic System. It is the newest part that processes our awareness that means the "*Mano*" when we talked about perception, constructed into images, then that is processed here in the Cerebral Cortex. It also controls our Attention System. When we pay attention to something, this part of the Brain is quite active.



And one of the most important functions that had developed from here is the function of language. It was because of language that made us more intelligent. It is language that helps us communicate and learn things faster and learn from each other. Without language we would not be learning from each other, we would only be learning by observation but not by exchange of information. And as a result of that we have developed logic, reasoning, and very importantly, learning capability, and critical thinking, that means ability to analyze and synthesize. Analyze is to break things down to their components; synthesize is to put these little bits and pieces together to make up the big picture. So we are able to do both, analysis and synthesis, and then also controlling the decision-making process, goal setting, and planning.

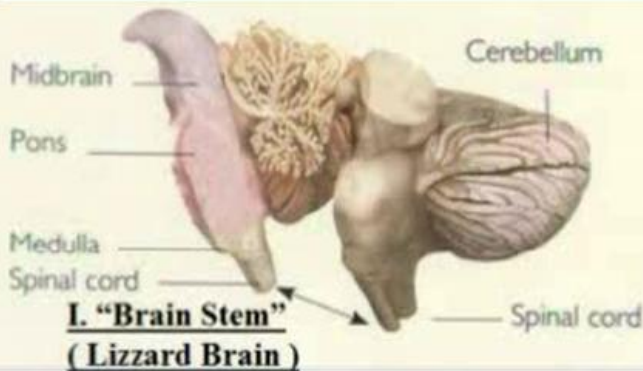
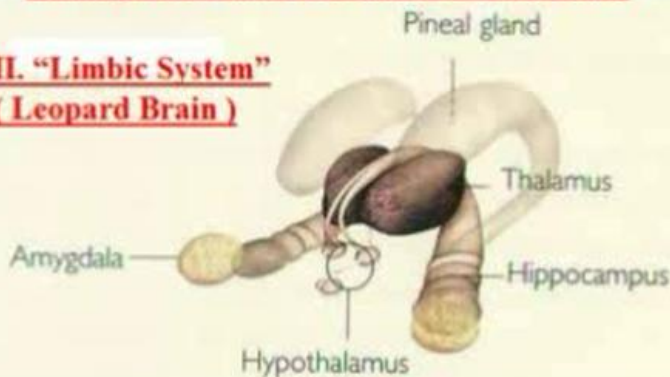


# THE TRIUNE BRAIN



## EMOTIONAL COMMAND CENTER

### II. "Limbic System" ( Leopard Brain )



Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

When we look at the Brain structure, we're looking here at the older part the bottom is the Brain Stem; I won't talk much about that. The upper part is actually a very important part we have to pay a bit of attention to the Limbic System; this is our Emotional Command Center. It is made up of several tissues. I'm only showing here a few important ones. We'll just cover the few important ones because it will help you understand what happens in your Mind when all this is going on.

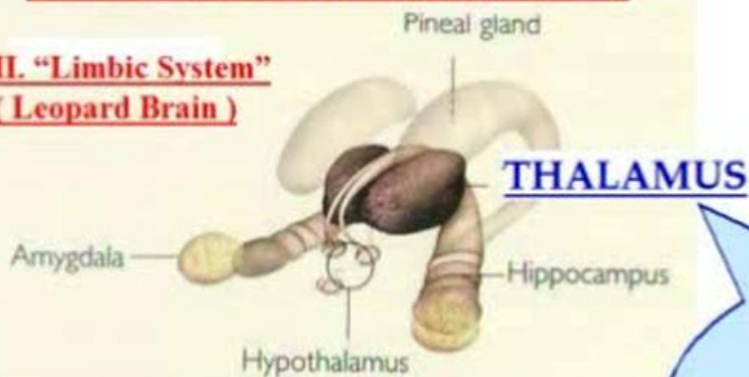


# THE TRIUNE BRAIN

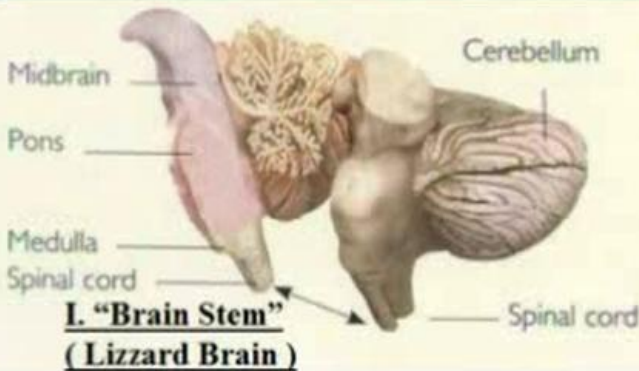


## EMOTIONAL COMMAND CENTER

### II. "Limbic System" ( Leopard Brain )



THALAMUS  
Relaying sensory  
information &  
alertness



Ven. Dr. M. Punjabi Maha Thera

CONSCIOUSNESS (October 2011)

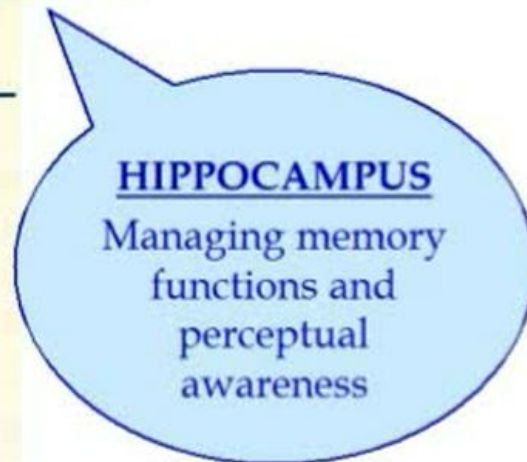
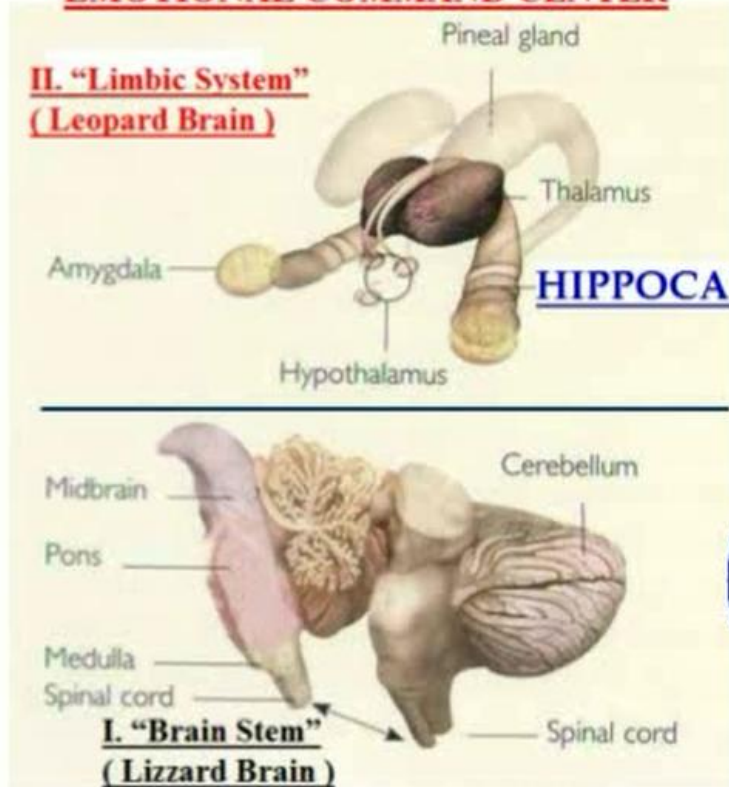
The first is Thalamus. Thalamus is actually responsible for relaying sensory information and your alertness, that means all your senses, whatever you see, whatever you hear from the auditory nerves and optical nerves; all that information comes through the Thalamus, and Thalamus is responsible for sending them to different parts of the Brain for processing. In the case of what you see, then it goes to the Visual Cortex of the back of the head and so on. So this part of the brain is very important; it relays sensory information. But this also means something very important; whenever we see something, whenever we hear something, instantaneously it goes through our Emotional Brain, that's why naturally our instinct is to react emotionally. Before it goes to anywhere else, information reaches the emotional part of our Brain twice as fast as it reaches the thinking part of a Brain, and Thalamus is responsible for directing this information.



# THE TRIUNE BRAIN



## EMOTIONAL COMMAND CENTER



Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

The next one is Hippocampus which manages Memory Functions as well as perceptual awareness. Memory Functions are very important here because whenever we see something, it is like water under the bridge, it passes very fast and then it's gone. What Hippocampus does is it takes your short-term experience, what you have just seen it converts it into long-term memory and stores it away in a categorized manner. So when Bhante was talking about the "*Papañca*", the categorized part of your Memory, Hippocampus is very much responsible for doing that.

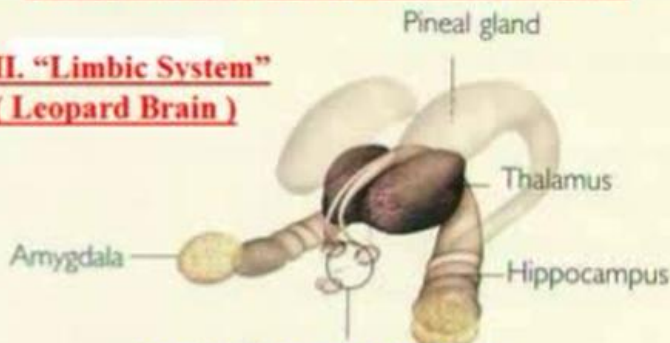


# THE TRIUNE BRAIN



## EMOTIONAL COMMAND CENTER

### II. "Limbic System" ( Leopard Brain )



## HYPOTHALAMUS



### I. "Brain Stem" ( Lizzard Brain )

## HYPOTHALAMUS

Release of neurotransmitters and hormones, bio-chemical reactions in the body

Ven. Dr. M. Punjabi Maha Thera

CONSCIOUSNESS (October 2011)

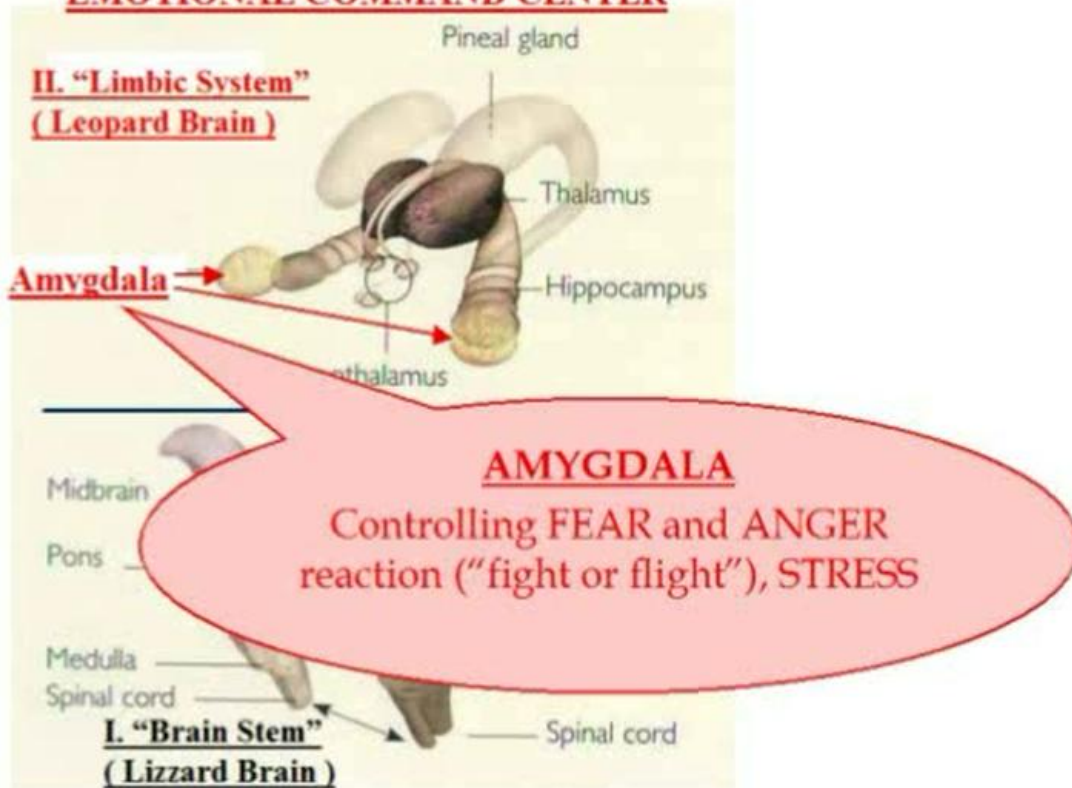
Then comes the next one, Hypothalamus; this is actually our Biochemical Center. This is responsible for the release of neurotransmitters and hormones in our body. This is the part of the brain that controls Biochemical Reaction in the body. Next week we will see a video of a very detailed video on this, but this week I won't be showing that; I'll be showing something else first.



# THE TRIUNE BRAIN



## EMOTIONAL COMMAND CENTER

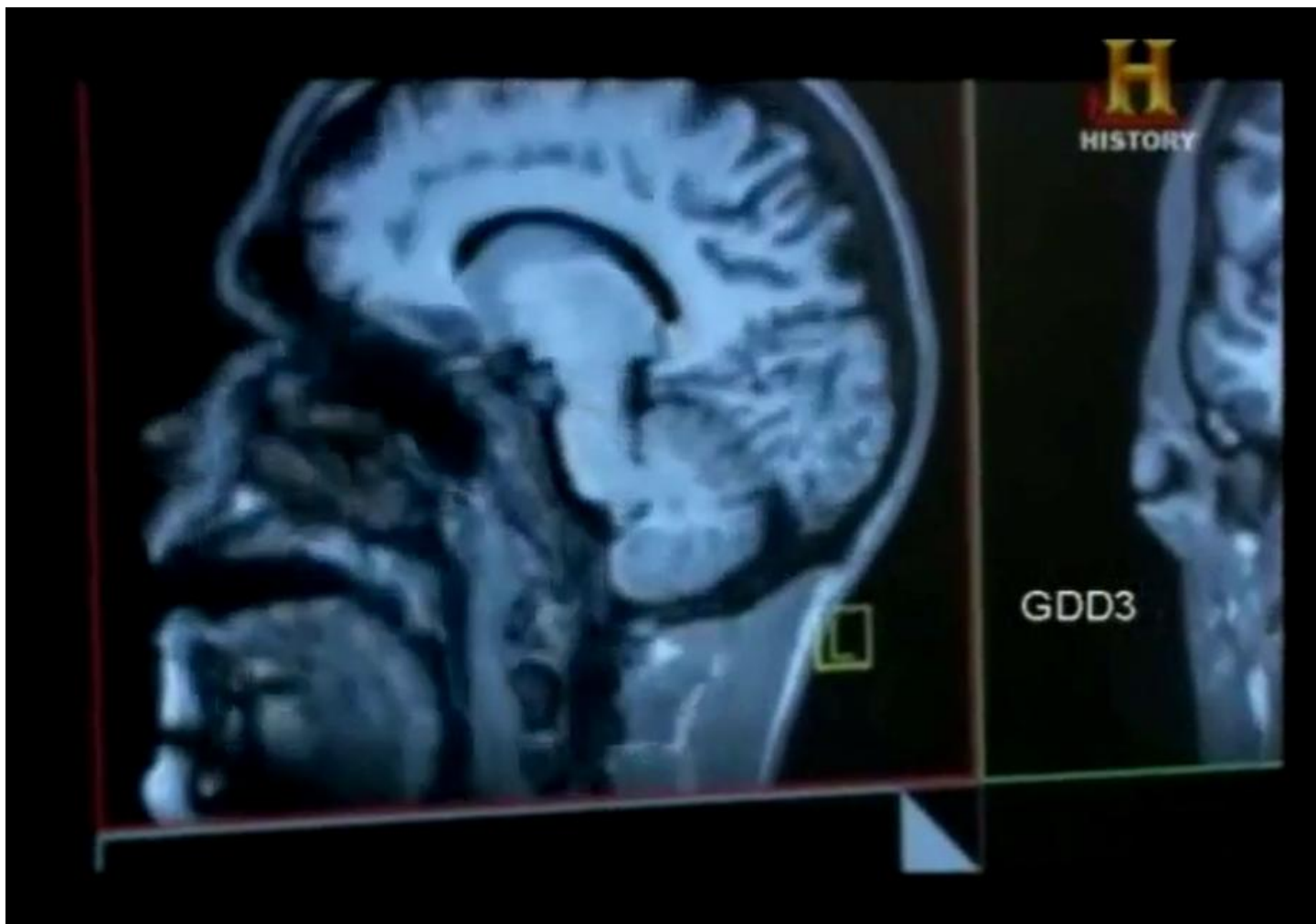


Ven. Dr. M. Punjabi Maha Thera

CONSCIOUSNESS (October 2011)

Then comes, of course, the most notorious part of our Brain, the Amygdala; the part that is responsible for all our fears, our Anger, and in fact the part that causes a lot of Stress in our body because Stress is nothing but a Biochemical Reaction making us feel uncomfortable. So the Amygdala is in the Limbic System, so all these are the major parts of the Limbic System that make us Emotional.

Let's take a look at how these three portions of the Brain has evolved. They call this the Triune Brain, which means they are three parts of the brain evolved over millions of years.



*As humans have evolved, it's doubled in size, it weighs only 3 pounds, but it consumes 20% of all the fuel our bodies taken in generating enough energy to keep a light bulb burning.*



*You'd have to consider the brain having evolved like an old house, where we just added different rooms, so there are all these stairways and connections.*

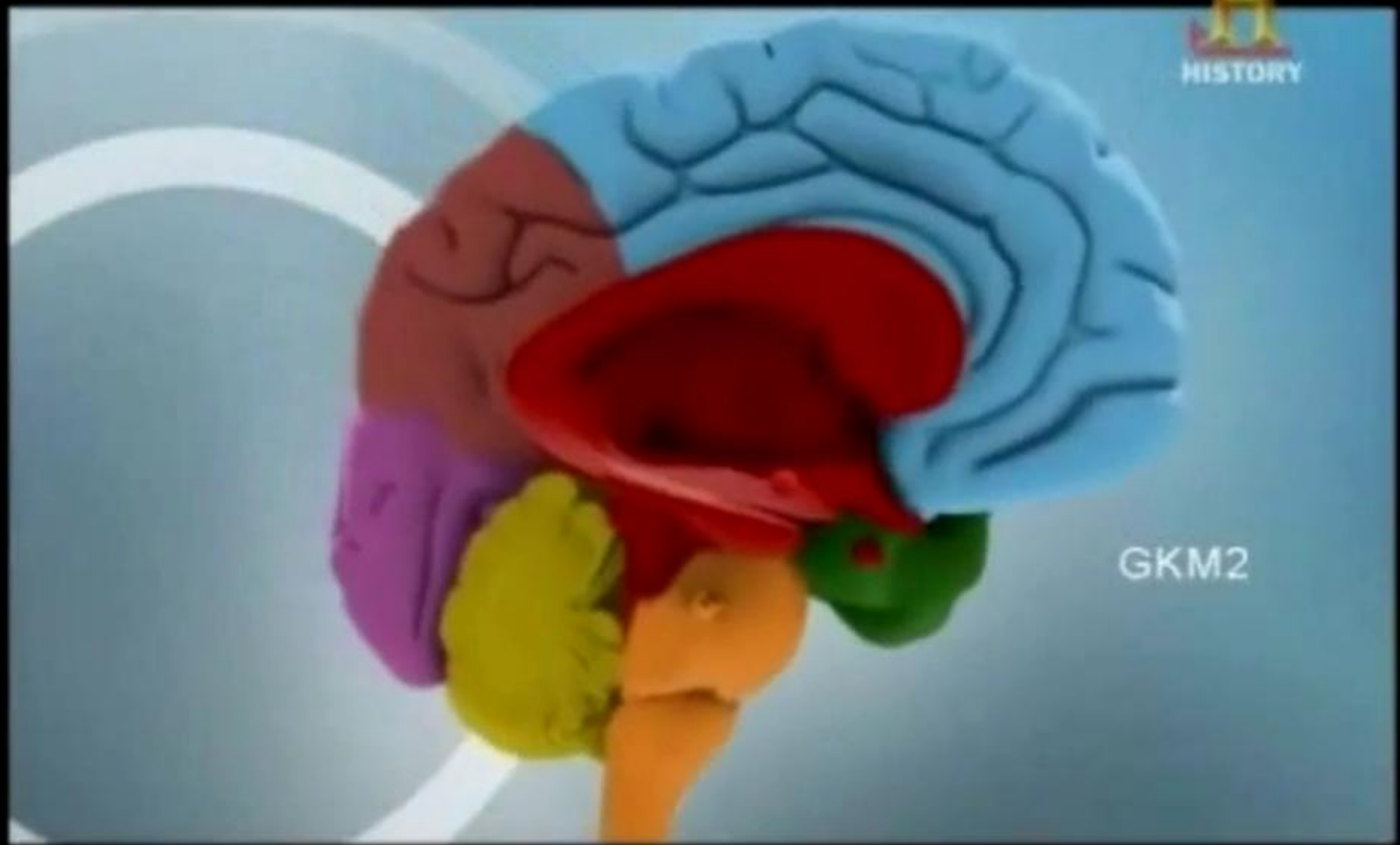


EIP1





GKM2





*In the basement is the oldest part called the Brain Stem; it's something we share with reptiles and other mammals.*



*It's what keeps us alive governing vital functions like heart rate, respiration, digestion, and blood pressure; things that happen without having to think about them.*



*The next level up, the first floor, more evolved hundreds of thousands of years later; it's called the Limbic System. This is very important in the processing of Emotions.*



GDD3



THE  
LIMBIC  
SYSTEM

GDD3



HISTORY

# THE LIMBIC SYSTEM

GDD3



HISTORY

# THE LIMBIC SYSTEM





*Within the Limbic System are the Amygdala two nuggets of tissue, one in each half of the brain. They are no bigger than a fingernail; yet they are the brain Central Command Center for our Emotional Reactions. One of the simplest and strongest of these is Fear, a primal emotion we all share.*



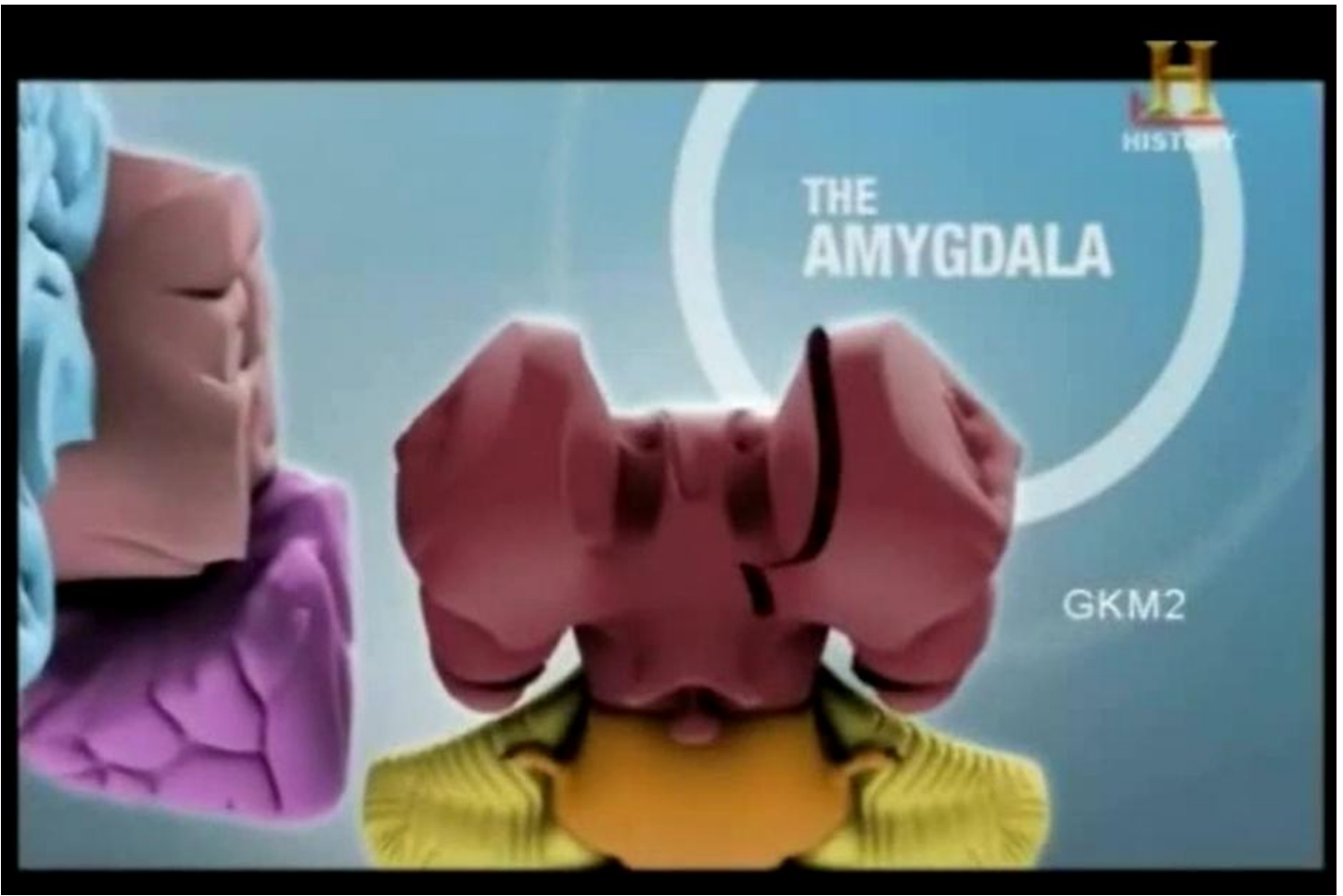
# THE AMYGDALA



EIP1

# THE AMYGDALA









*If you had to pick one brain region that was most important in fear it would be the Amygdala.*

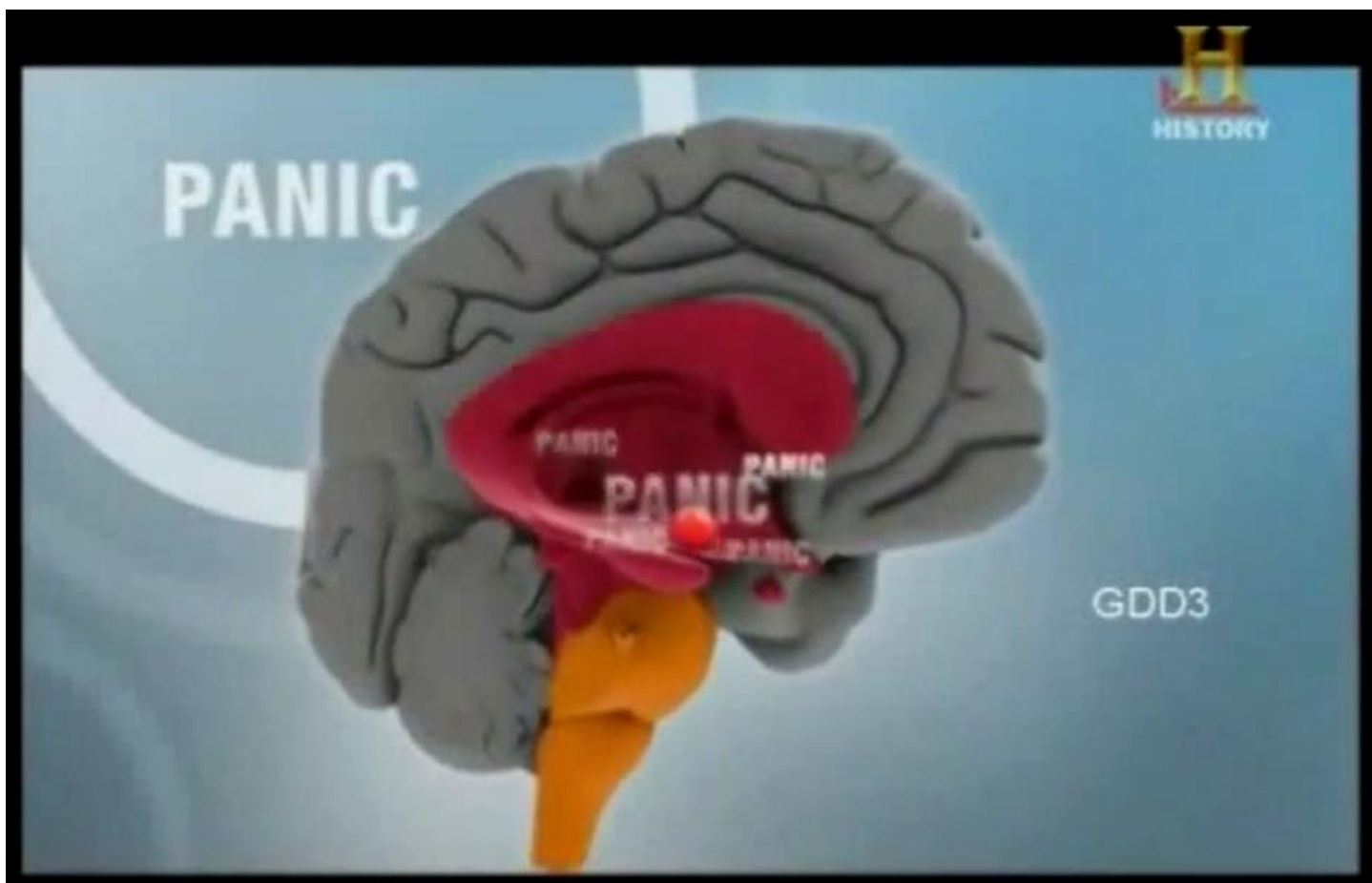


PANIC



PANIC





*When confronted with fear, it's the Amygdala that responds to information from our senses and instinctively presses the body's panic button.*



*The Amygdala is actually one of the most interconnected regions of the brain, so it actually will both send signals to parts of the Brain Stem that now enlists a range of bodily responses, as you start to sweat, your heart races, you know, you might freeze for awhile, you might run away.*

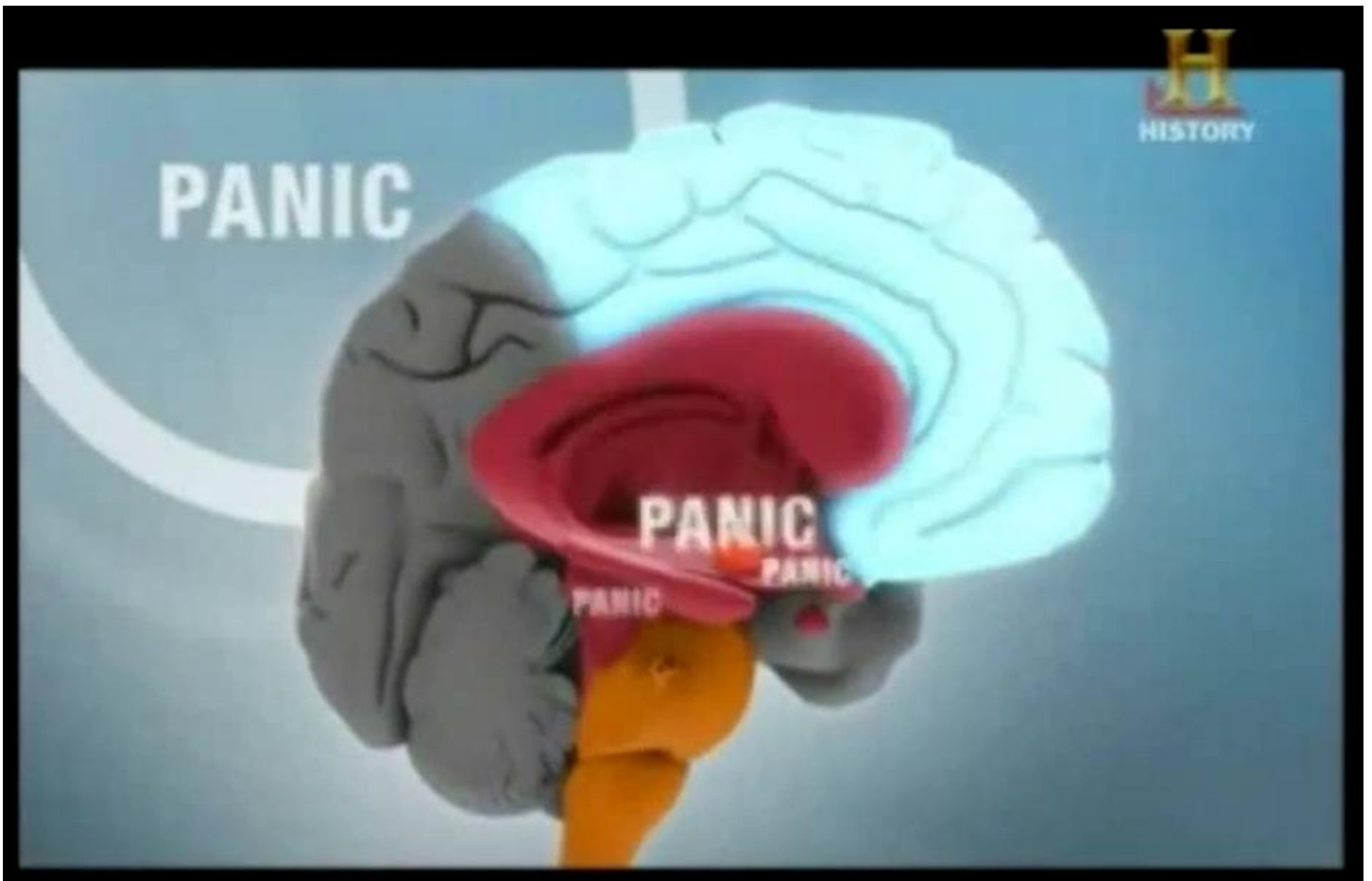




GKM2



GDD3



*What scientists discovered is that as humans evolved, another part of the brain called the Cortex also became involved in processing fear.*



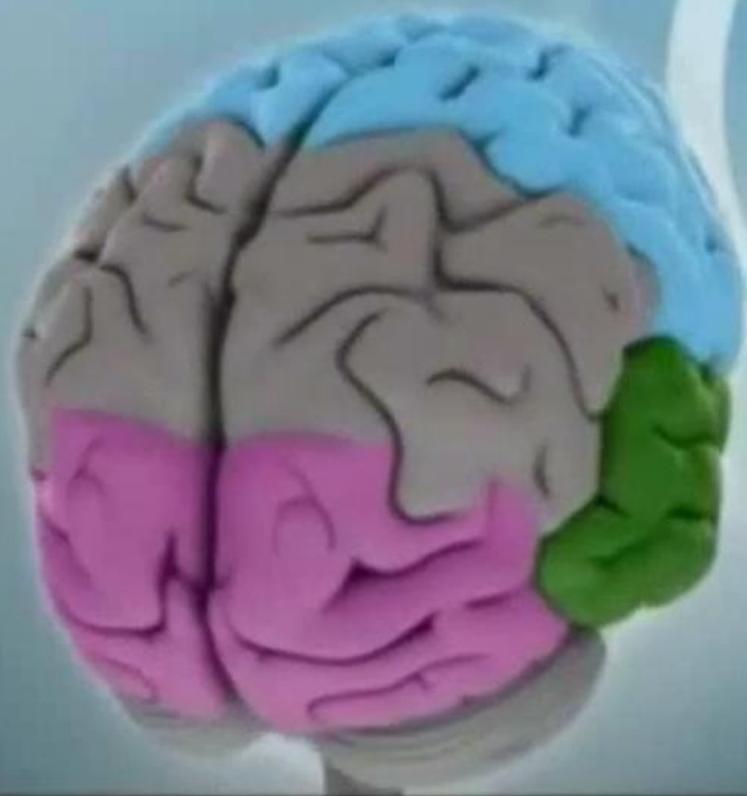
*The part that makes us most human about the brain is our Frontal Cortex.*

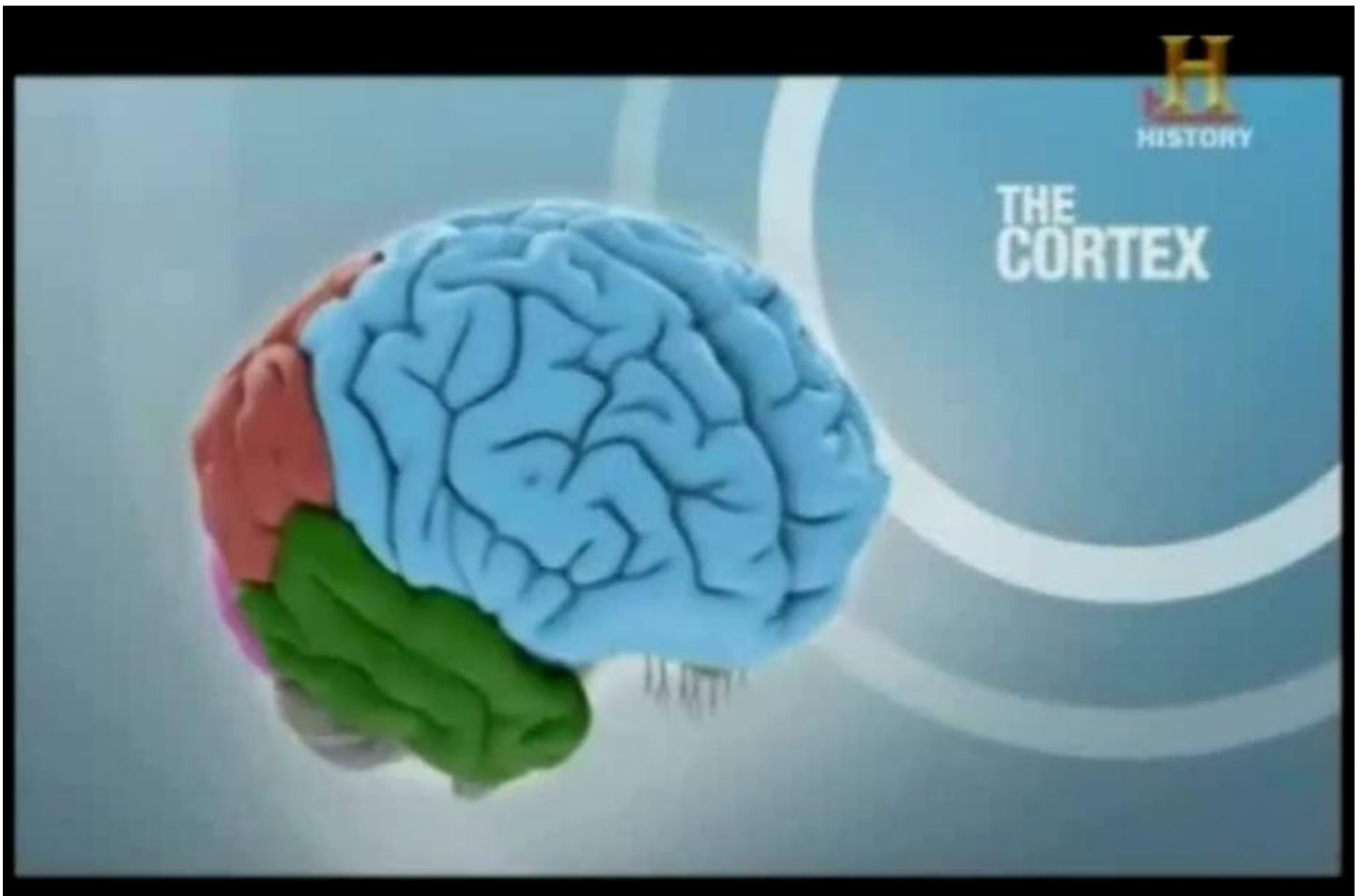


# THE CORTEX



# THE CORTEX

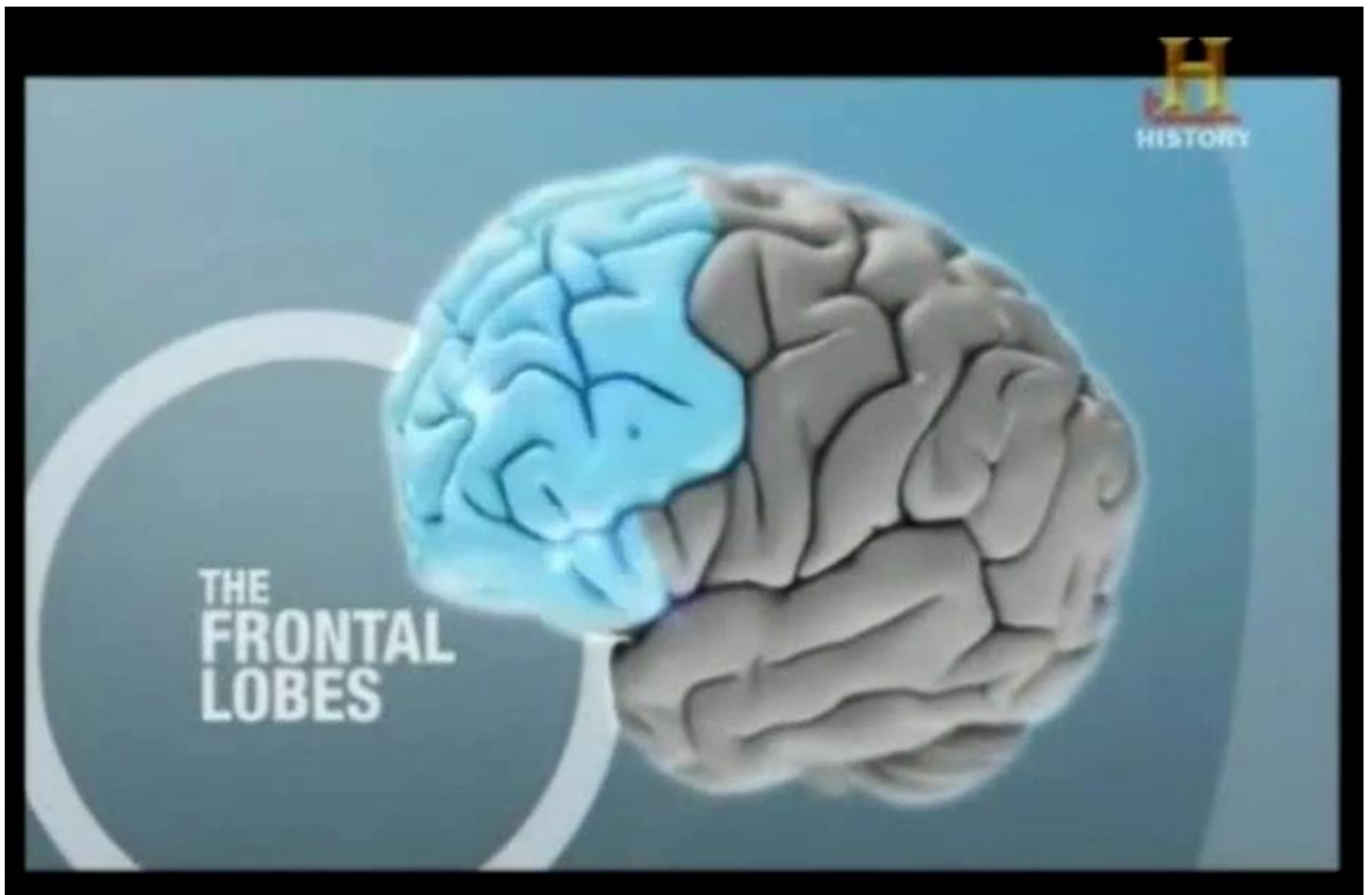




*If the Amygdala is the first floor, the cortex is the second floor of the Brain. It's the brain's thin, wrinkly, outer layer that's divided into four sets of Lobes.*



*If you unfolded the cortex of a monkey, it would be about the size of a piece of paper. If you unfolded our Cortex, it's about four sheets of paper large. And the reason it's wrinkly is because you have to squish that all inside of the skull.*

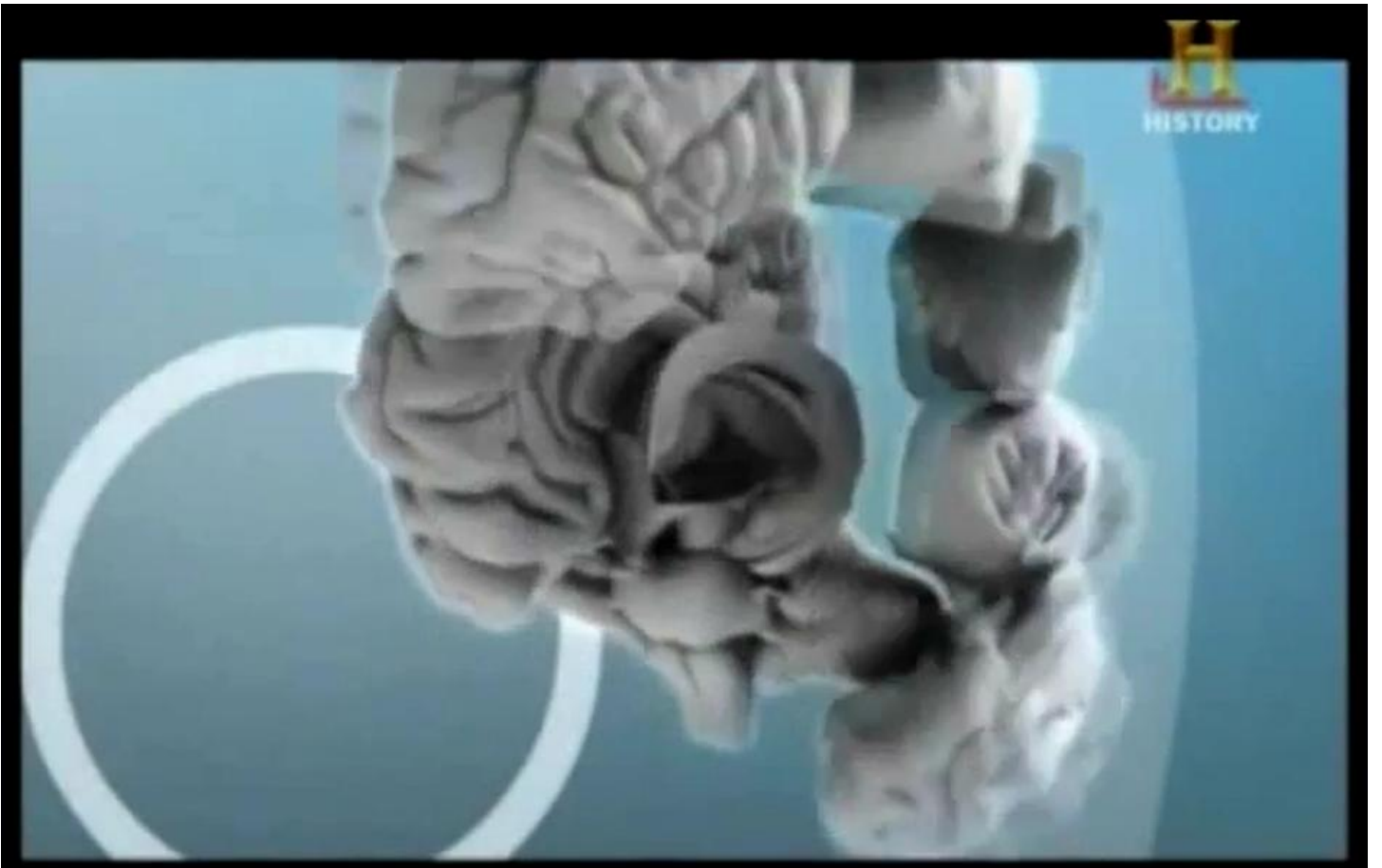
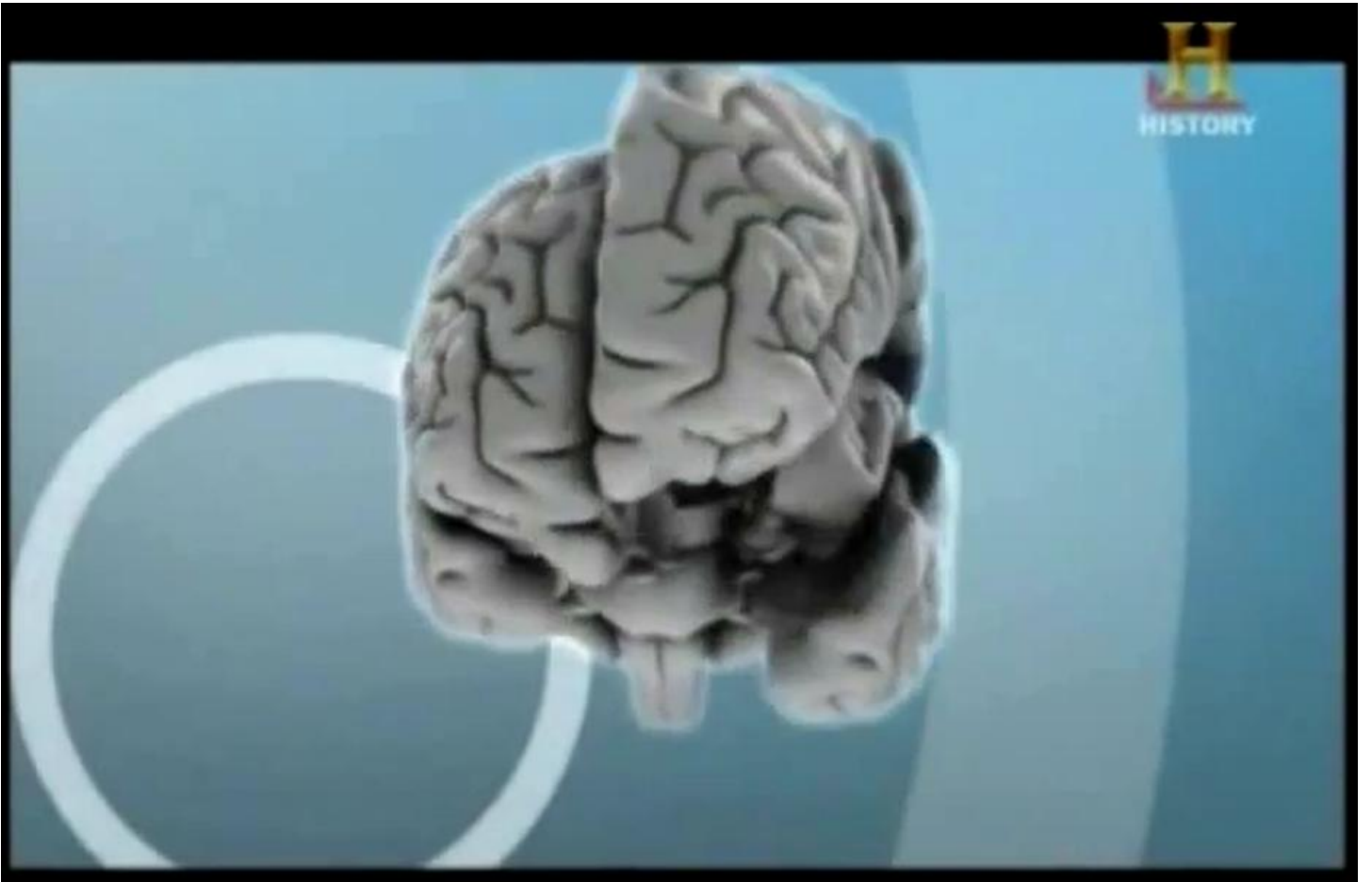


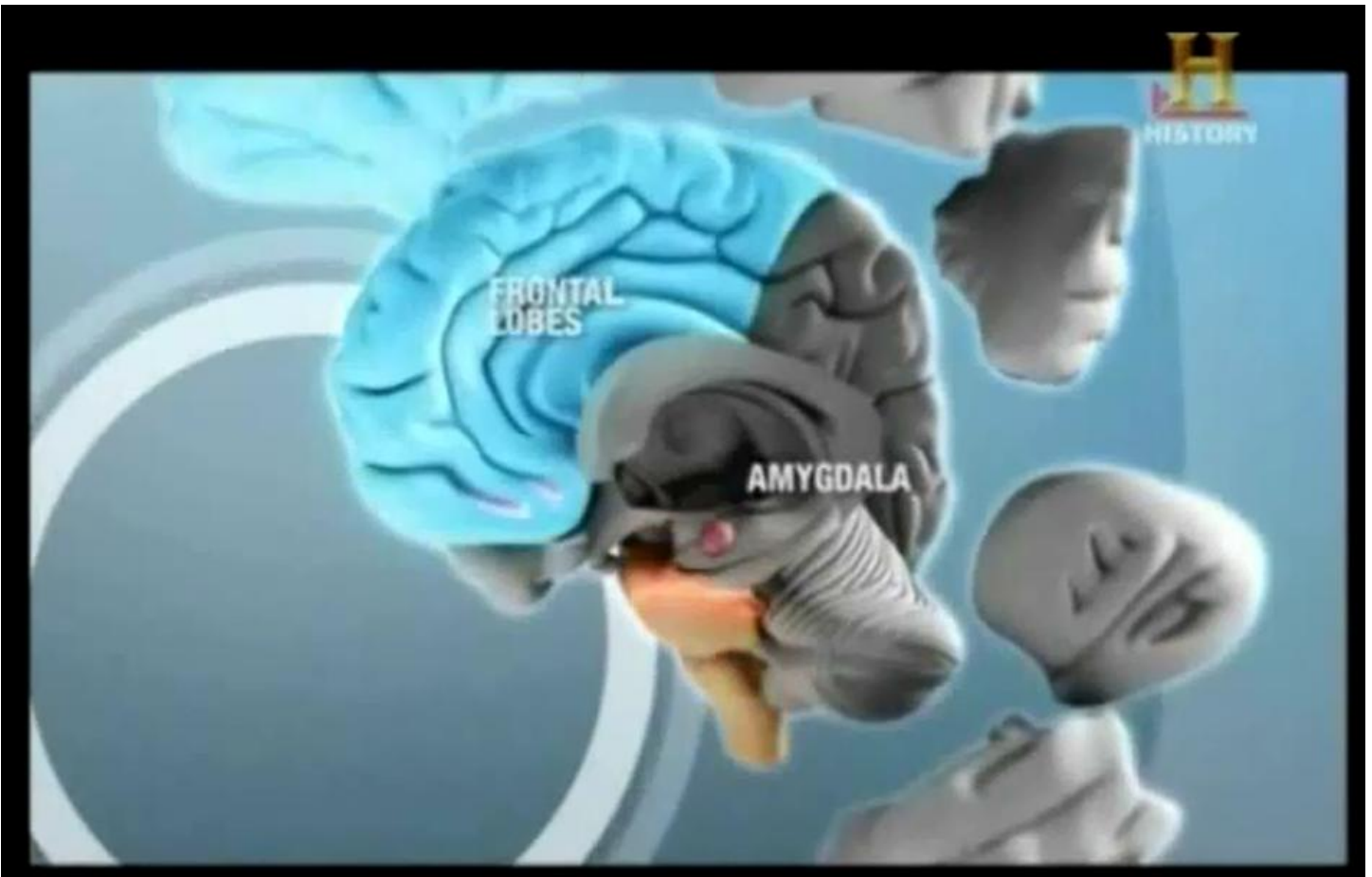
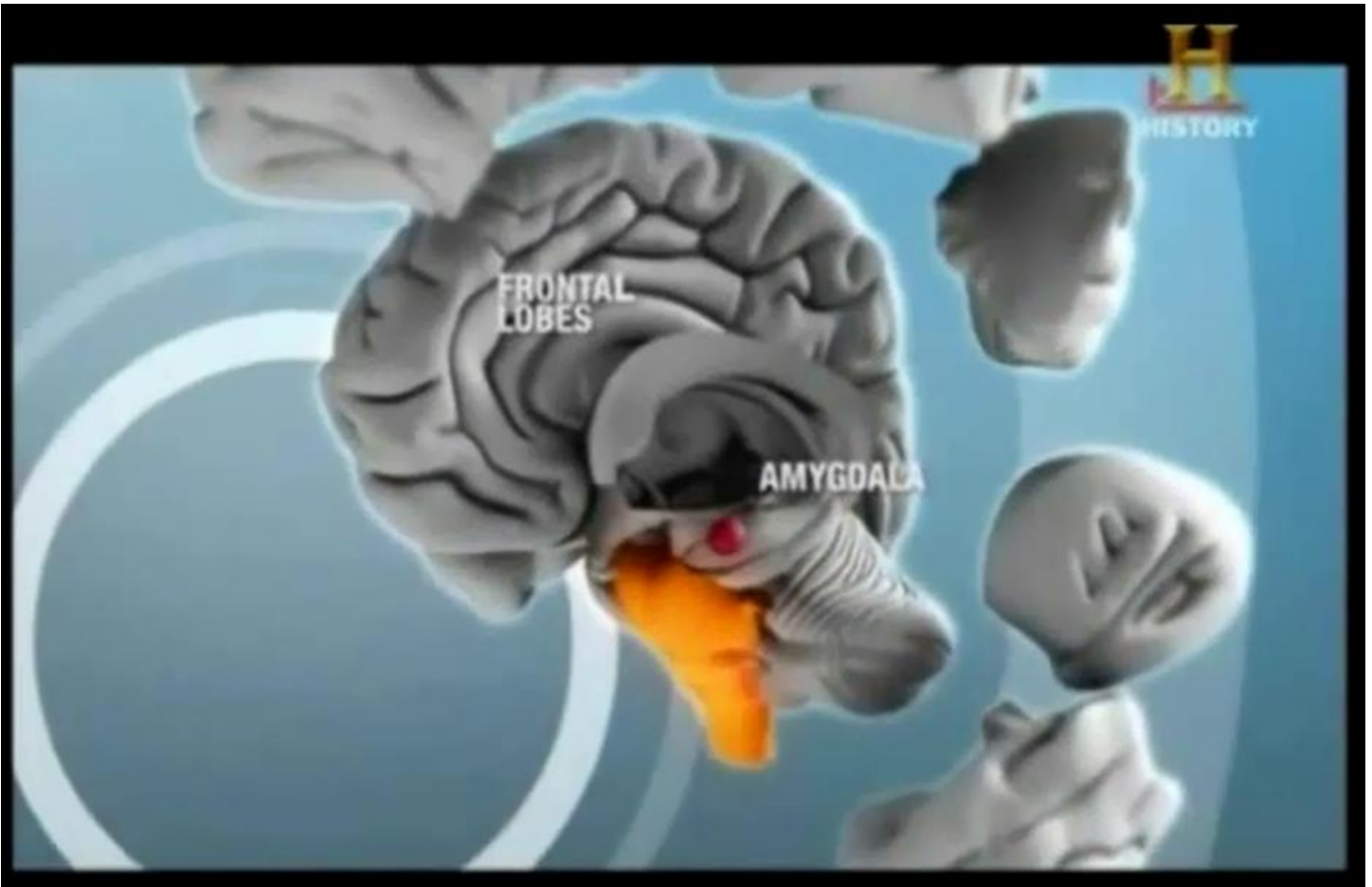
*The frontal lobes comprise the area just above our eyes and these are the newest rooms of the brain. As humans evolved the, frontal lobes became the place where conscious, rational thought is processed. It's where we do our problem solving.*

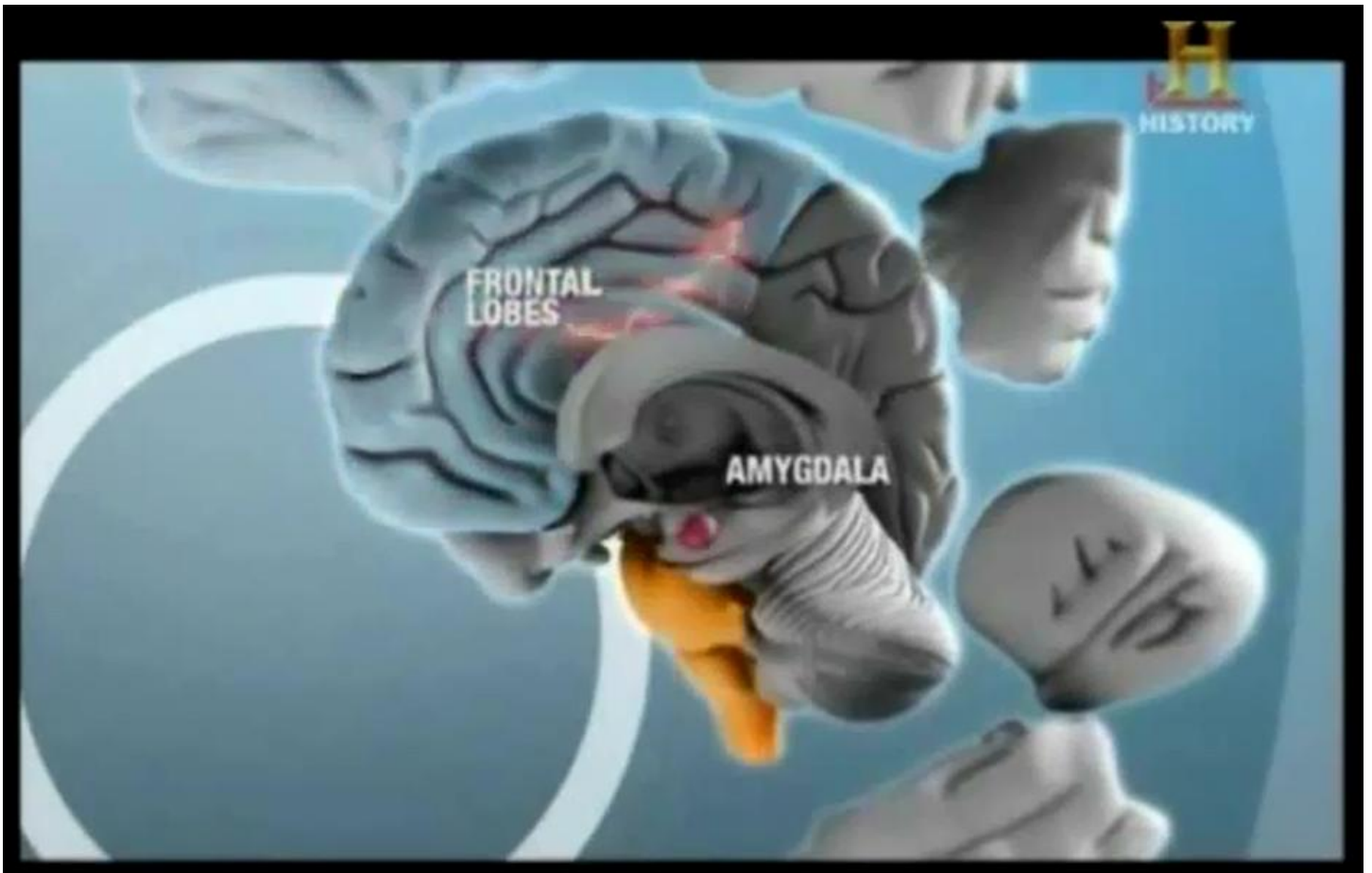


*The frontal lobes are so interesting because they're really the conductor of the brain. They synchronize all activity.*









*Scientists made a major breakthrough in fear research when they found that information from our senses reaches the Amygdala almost twice as fast as it takes to get to our frontal lobes. The speed of the different brain signals means, unless we instinctively know how to react to a potential threat, we may freeze and fear waiting for the frontal lobes to catch up to figure out the right response.*



*Part of what happens with fear and panic is the unknown. It's the not knowing what to do next, and so your brain essentially freezes the way a deer freezes in the headlight.*



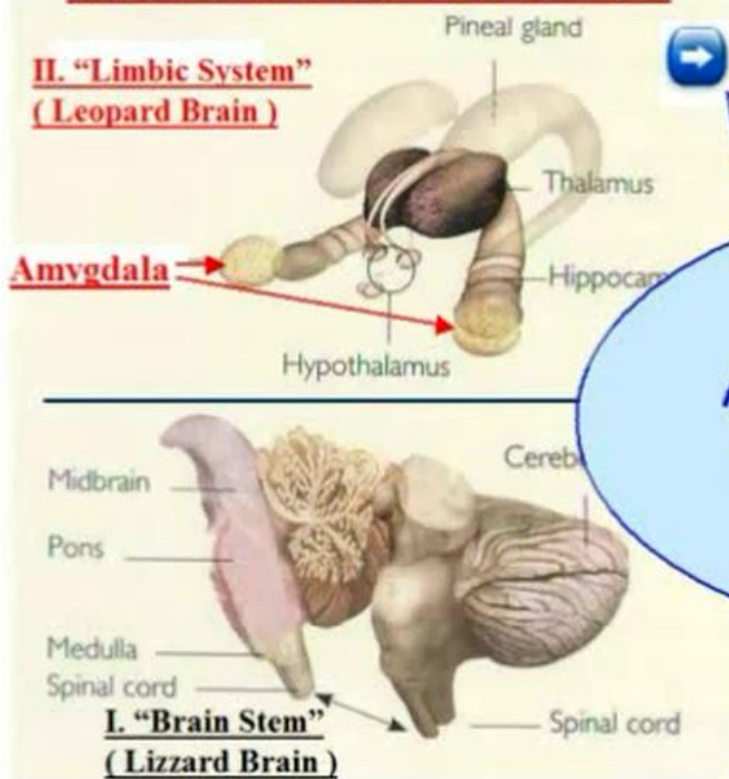
*So the Amygdala may get very fast signals about fear, um, even but sometimes they're wrong, and quickly the situation may say to you that was not a fear situation, and you're not afraid. So this very quick Amygdala signals that you get can be controlled in a sort of a top down way.*



# THE TRIUNE BRAIN



## EMOTIONAL COMMAND CENTER



Controlling the Amygdala (anger and fear reactions) in a "Top Down" way...

Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

The last statement she said, "The Amygdala can be controlled in a top-down way." I am going to talk about in a moment. Now just very quickly on the Amygdala. What happens is whenever our senses sense something in the environment, the first thing that happens is the Amygdala checks that signal, that information and determine whether it's a Threat or not. Now it does not require any much thinking to do that because over millions of years of Evolution, we've evolved what we call Natural Instincts, so it's instinctive for the Amygdala to determine whether something is a Threat.

If an object is moving towards you at high speed, that is a Threat. If there is a lot noise, that is a Threat. If you perceive that you are about to fall off the edge of a cliff, that is a Threat. So the Amygdala does not need much intelligence to determine whether there is a Threat, as long as there's loud noise, as long as there is heat around your body but something burning, as long as an object is moving towards quickly, the Amygdala immediately fires off a series of chain reaction called Fight-or-Flight Reaction.

And that causes your whole body to react in a biochemical way. You will get all kinds of hormones being secreted from Adrenaline to Cortisol. Adrenaline helps you fight with the Fear, the Threat. The Cortisol actually does a few other things; I'll talk more about that in next week.

So what happens is the Amygdala is doing some damage into the body if you don't control it. People who are very angry, what happens is that, it triggers off the Amygdala because Anger is nothing but the perception of Threat. When somebody says something you don't like, you get angry, and that is because when you don't like what he's saying, you perceived what he says to you as a Threat. So the Amygdala kicks into action and causes this Fight-or-Flight Reaction. So Anger Reaction and Fear Reaction are almost identical in this case, biochemically.

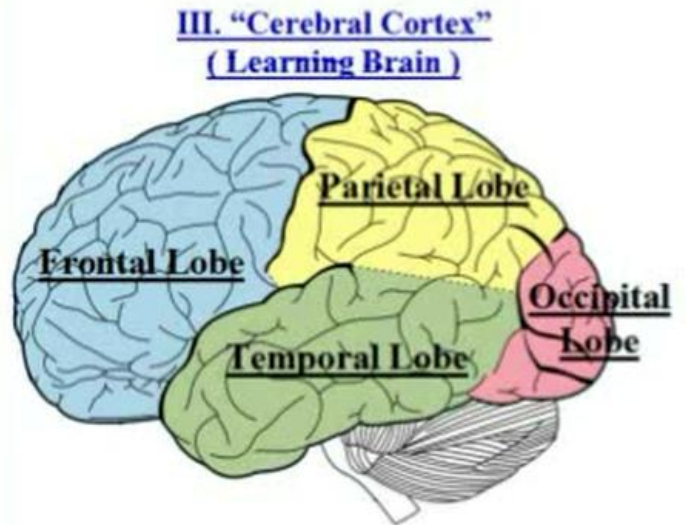
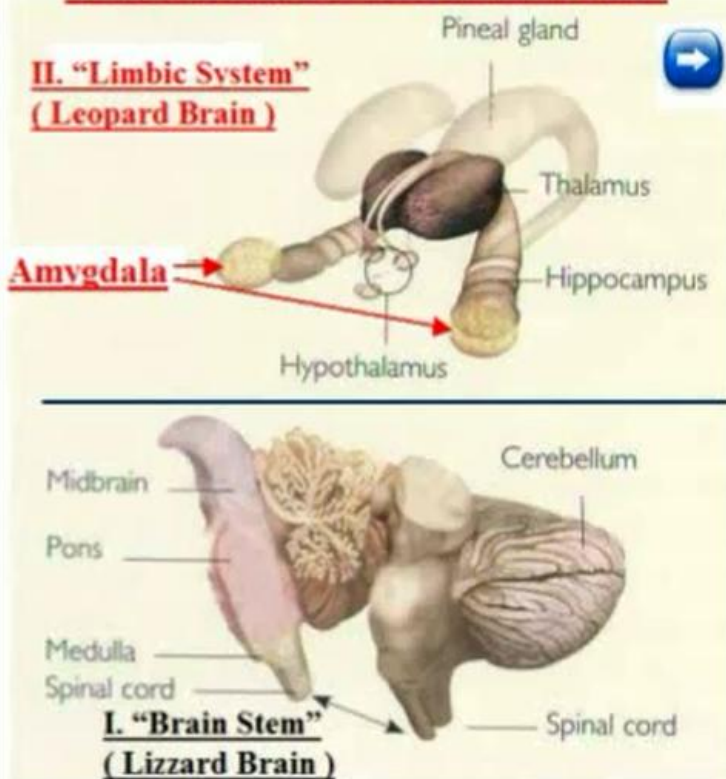
Now the brain scientist there, the lady was saying you can control the Amygdala, the Anger and fear reactions in a top-down way, what does she mean by that?



# THE TRIUNE BRAIN



## EMOTIONAL COMMAND CENTER



Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

She means that because of the more recent Evolution of the brain, we are equipped with the Learning Brain, the Cerebral Cortex. And this is the part of the Brain that can help us control our Fear and our Anger.

Now let's go back to history, talk about the Evolutionary Process before we go back to talk about the Learning Brain.





# THE GREAT TRANSFORMATION

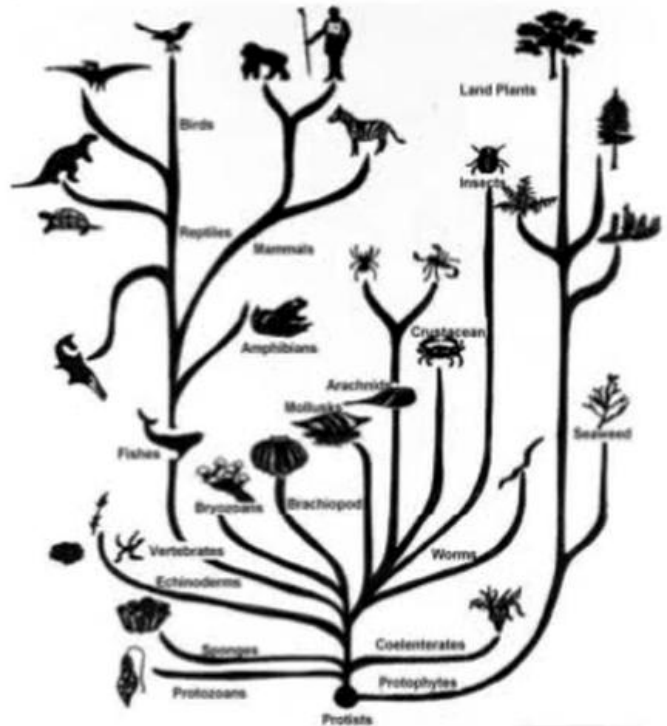


- CHARLES DARWIN: "On The Origin of Species" published in 1859
- Tree of Life



Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)



This person, I think some of you may know, Charles Darwin he wrote the book called "On the Origin of Species" published in 1859. He wrote it 30 years before he published it, but it was so revolutionary with those ideas that he was afraid of publishing it because he came from a Christian background and his wife was a very staunch Christian.

It basically, in a nut shell, said that species evolved from one another, so he calls this the "Tree of Life". He describes evolution of species like branches in a tree. You get new branches coming up just like new species are appearing, and you get old branches dying off just like old species are going extinct, and then you get branches going nowhere which be some species appear and disappear very rapidly.

And for your information in the history of humanity that had been more than fifteen different species of Human Beings. We were the last. The first was called Homo Habilis, then evolved into other species called Homo Erectus. The last one before us was called Neanderthals, and we were the last. We were the last human species surviving.

So that is the “Tree of Life” and he says it is a struggle for existence. And in this struggle, of course, the Homosapiens outperformed all the other human species and we survived. But the struggle for existence basically means every species has to deal with the changing environment. And natural selection basically means as the environment changes only those species that can adapt to the changing environment survive: Survival of the Fittest.

And of course with any species there are various Divergence, so human species also have some Divergence. If you look at people of different races, you may find slightly different facial structures or bone structures. You may find, for instance, that some people who have a heightened eyebrow, some people have flat nose, and some races of people have high nose, and so on. And some are bigger and some are smaller.

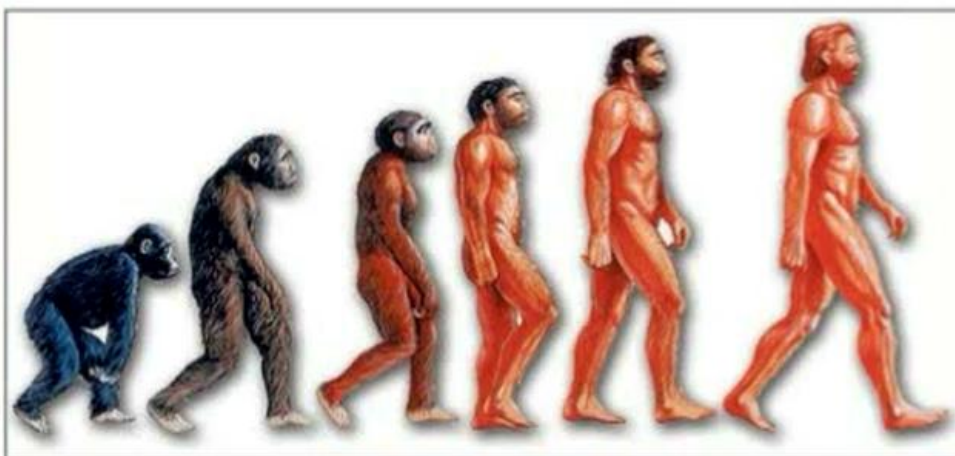
Now the size of the person, the height of a person is very much determined by the kind of food they consume; whereas, the width of a person is very much determined by the weather. This is why if some of you may know 50-60 years ago, Japanese are very short. Today you go to Japan you probably the shortest guy around. Somehow due to the diet of the Japanese, they grew taller generally, and that is a part of this Divergent Process.



# THE GREAT TRANSFORMATION



- CHARLES DARWIN: "On The Origin of Species" published in 1859
- Tree of Life
- Struggle for existence
- Natural selection
- Divergence
- The Great Transformation



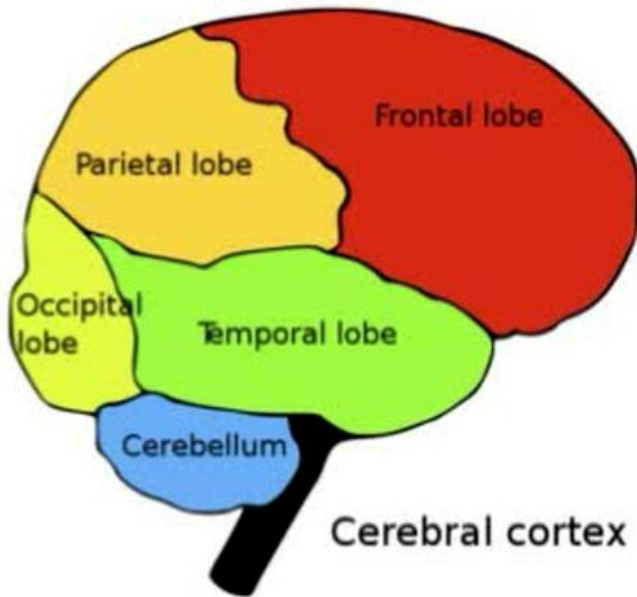
Ven. Dr. M. Punjabi Maha Thera

CONSCIOUSNESS (October 2011)

And finally he calls all this transformation The Great Transformation from one species to the other. So there had been 15 species of Human Beings, and we were the last surviving because of a number of things that happened to us that help us become smarter. And one of the things is the Evolution of the Frontal Lobe.



# THE LEARNING BRAIN



Frontal Lobe



Parietal Lobe



Temporal Lobe



Occipital Lobe

Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

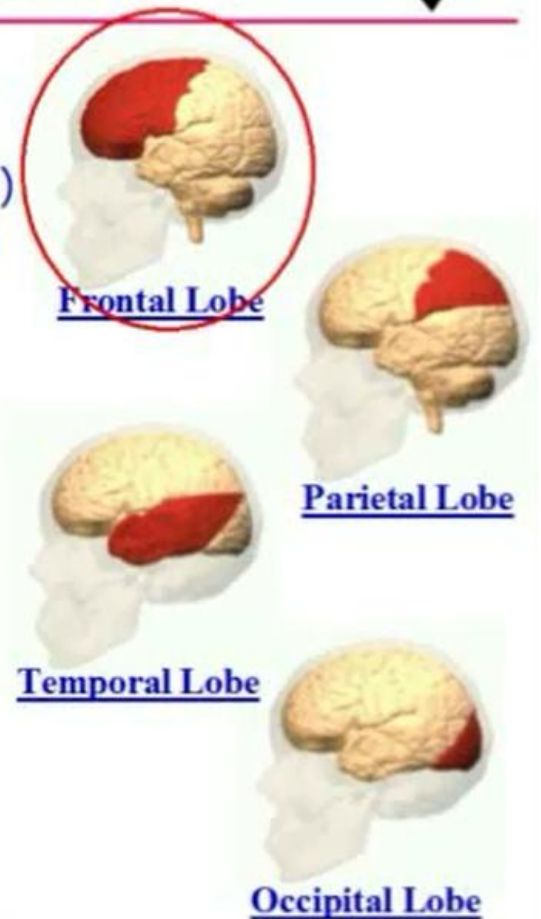
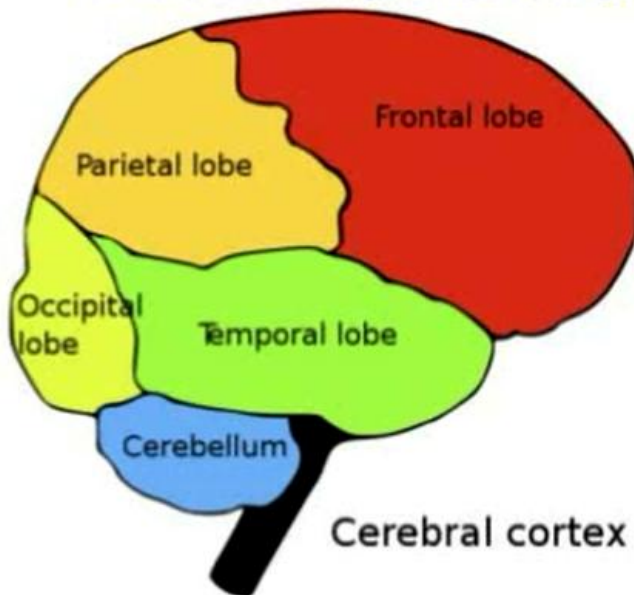
So we take a look at the Learning Brain now. There are four main Lobes in the in our Learning Brain. And this is just showing the left hemisphere. So our brain is made of two Hemispheres, two halves: a Left Hemisphere and a Right Hemisphere. So here is a picture of the Left Hemisphere showing the various Lobes in the Left Hemisphere. The Frontal Lobe is the part which is just on top of the forehead or behind the forehead, of this spot in the forehead there, that is the Frontal Lobe; the whole part that goes a little back. Right at the tip of the front is called Prefrontal Cortex, and that is the part of the Brain that is the most critical in terms of thinking power.



# THE LEARNING BRAIN



- ✓ Attention system
- ✓ Logic, Reasoning, Critical thinking
- ✓ Lateral thinking (creativity & innovation)
- ✓ Decision making, Goal setting, Planning



Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

So the Frontal Lobe is capable of these functions; in other words, these things that we're doing are the result of the Frontal Lobe activity: Attention System. When we pay attention to something, we focus our attention; we concentrate on something that is activating the Frontal Lobe, especially the Prefrontal Cortex, right up the front tip.

Then logic, reasoning, critical thinking; now logic, reasoning, critical thinking, you can go to a simple thing as one plus one equals two. And one of the reasons why we are the last Human Species surviving is because of Lateral Thinking. Lateral Thinking is the ability to look at different things, connect them together, and come up with a new idea; this is Creativity and Innovation. And the Homosapien species is known to have done that.

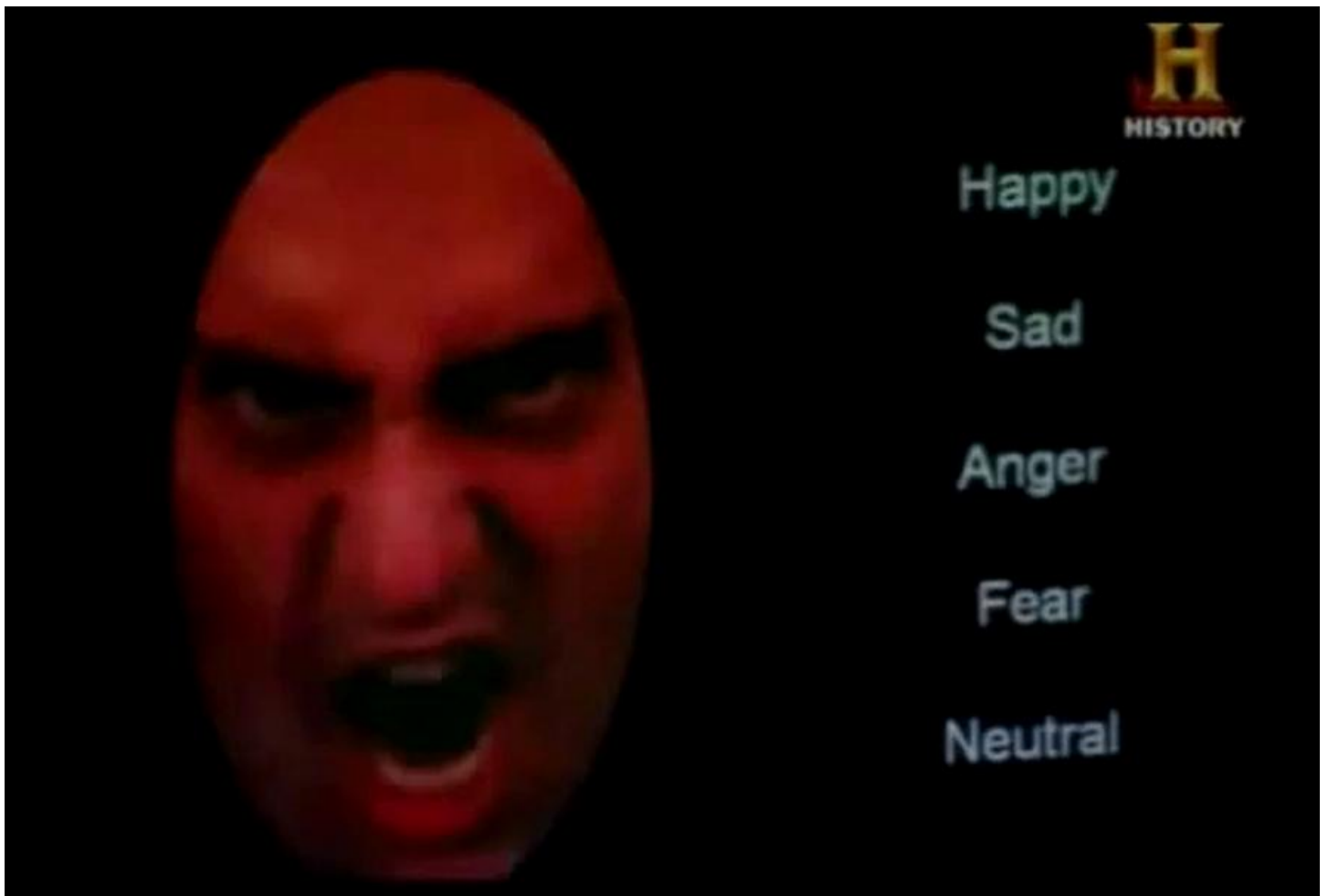
The species before us Neanderthals were so dumb; 300,000 years ago they were using old spears to hunt; 50,000 years ago, before they disappeared and that is the period 250,000 years, they were still using the same kind of technology to hunt. So for 250,000 years Neanderthals never evolved any intelligence on how to improve their hunting skills.

So this is the part of the Brain that helped Homosapiens become the most powerful and most intelligent species on Earth today: Lateral Thinking. If you think of logic as  $1 + 1 = 2$ , Lateral Thinking is one plus one equals three. So you have put two things together and create the third thing, and that's what Lateral Thinking is all about, and that is what makes us so intelligent, compared to other species.

Another important thing I want to mention is when you practice Meditation your Attention System is highly active. You are specifically looking, thinking of a specific thing, so you are critically looking, having this Introversion of Attention. Introversion of Attention and Introspection is critical thinking. So you're actually exercising Prefrontal Cortex. So when you meditate, you actually help yourself to become more intelligent, so that is a small little bonus for Meditating.

And the Frontal Lobe is also responsible for decision-making, goal setting, and planning.

Now I'm going to show you a video of a real case in history about a man, a grown-up who has some slight mental problem. He moved into live with his mother, but after a little while his mother couldn't stand whatever he was doing and got a bit upset and told him to leave. And when the mother told him to leave, his Amygdala perceived it as a Threat and started becoming hyperactive. Then he went into a fit. He started to hit his mother and killed her; hit her until she's dead and kill her. So when they finally examined this person, they found there was some damage to his Frontal Lobe in the past.



*Today scientists are beginning to examine exactly where anger comes from.*



*The brain perceives a lot of information, both from the outside world and from inside the body.*





*And there is one part of the brain called the Amygdala that serves the function of shifting through all that information and asking one question: “Is this a Threat? Is this something I should worry about?”*



*Dr. Ruben Gur has zeroed in on the Amygdala as the key instigator of anger.*



*This walnut sized lobe can quickly overwhelm the brain with uncontrollable rage.*



*Once there is perception of danger, there is a cascade of responses in the body that includes changes in heart rate and blood pressure and sweating makes your body ready to fight or flee.*





*The Amygdala is a primitive part of the brain. It exists because the human brain is made up of layers that were added on top of each other over the millions of years of evolution.*



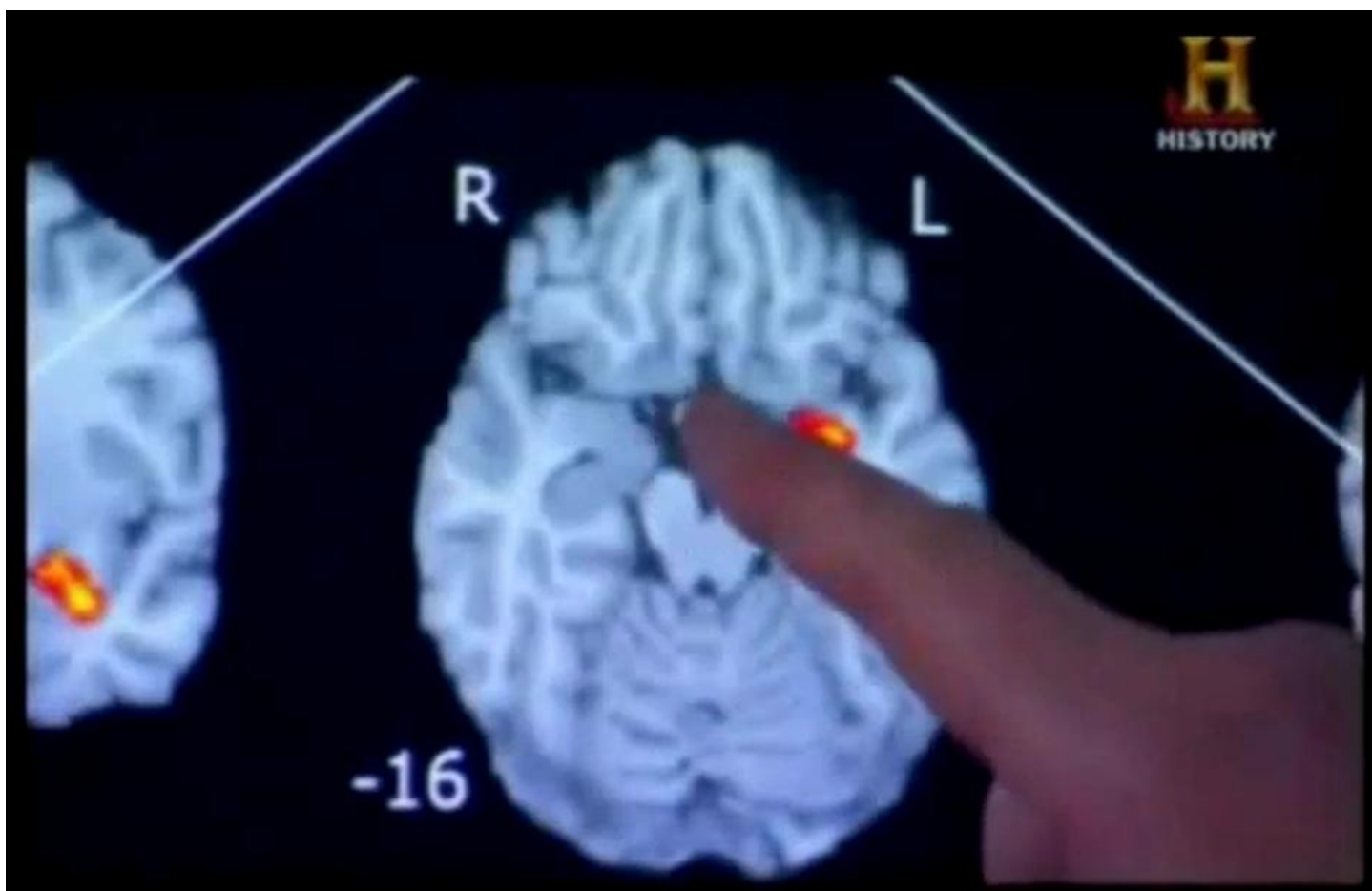


*All those other older brains are still alive and well inside your own brain. So you have a part of you that thinks like a dog, and you have a part of you the things like a crocodile, and a part of you the things like a monkey.*

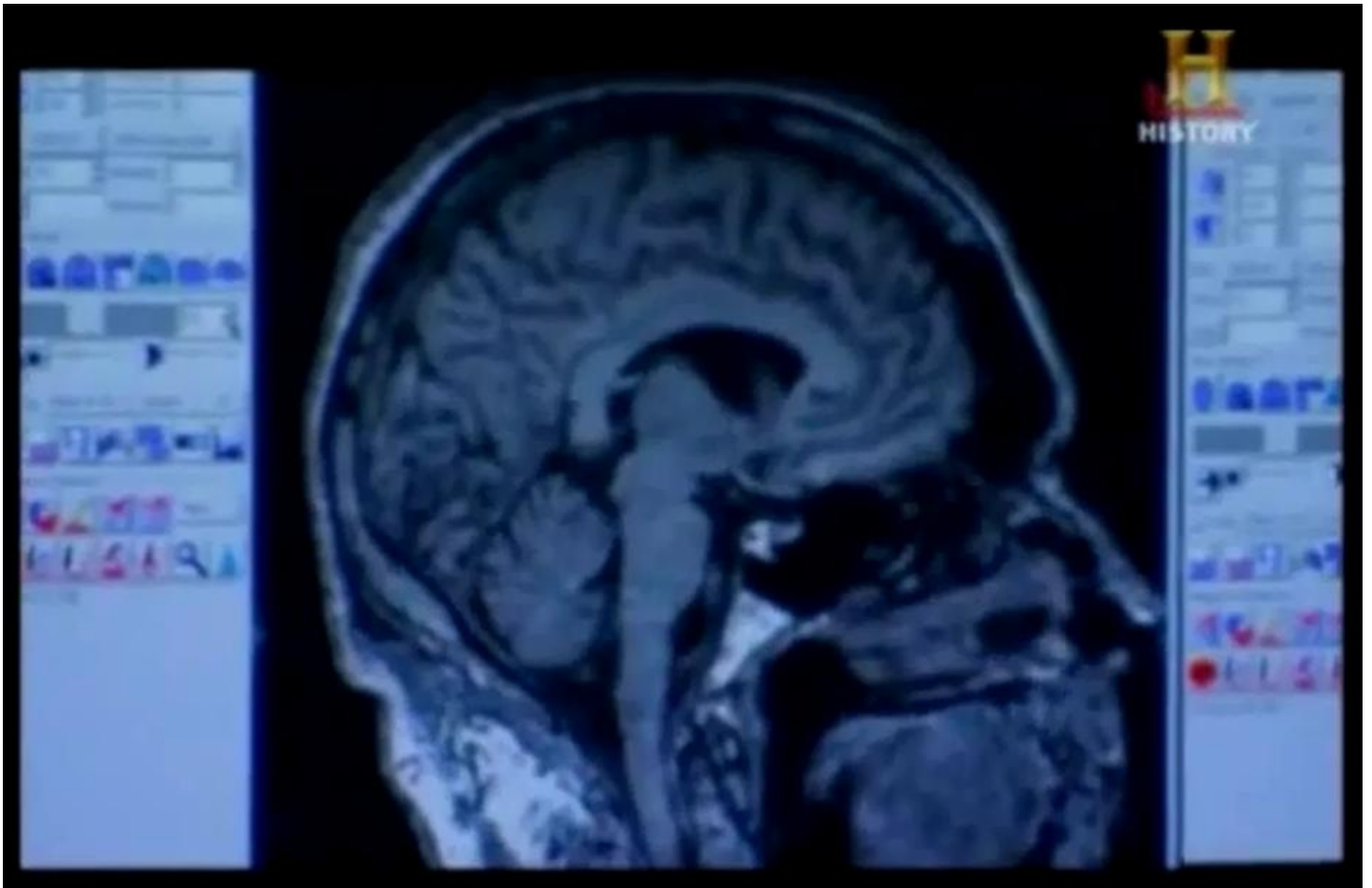




*The Amygdala creates an automatic Fight-or-Flight response to threats, but human beings have evolved another part of the brain the frontal lobes.*



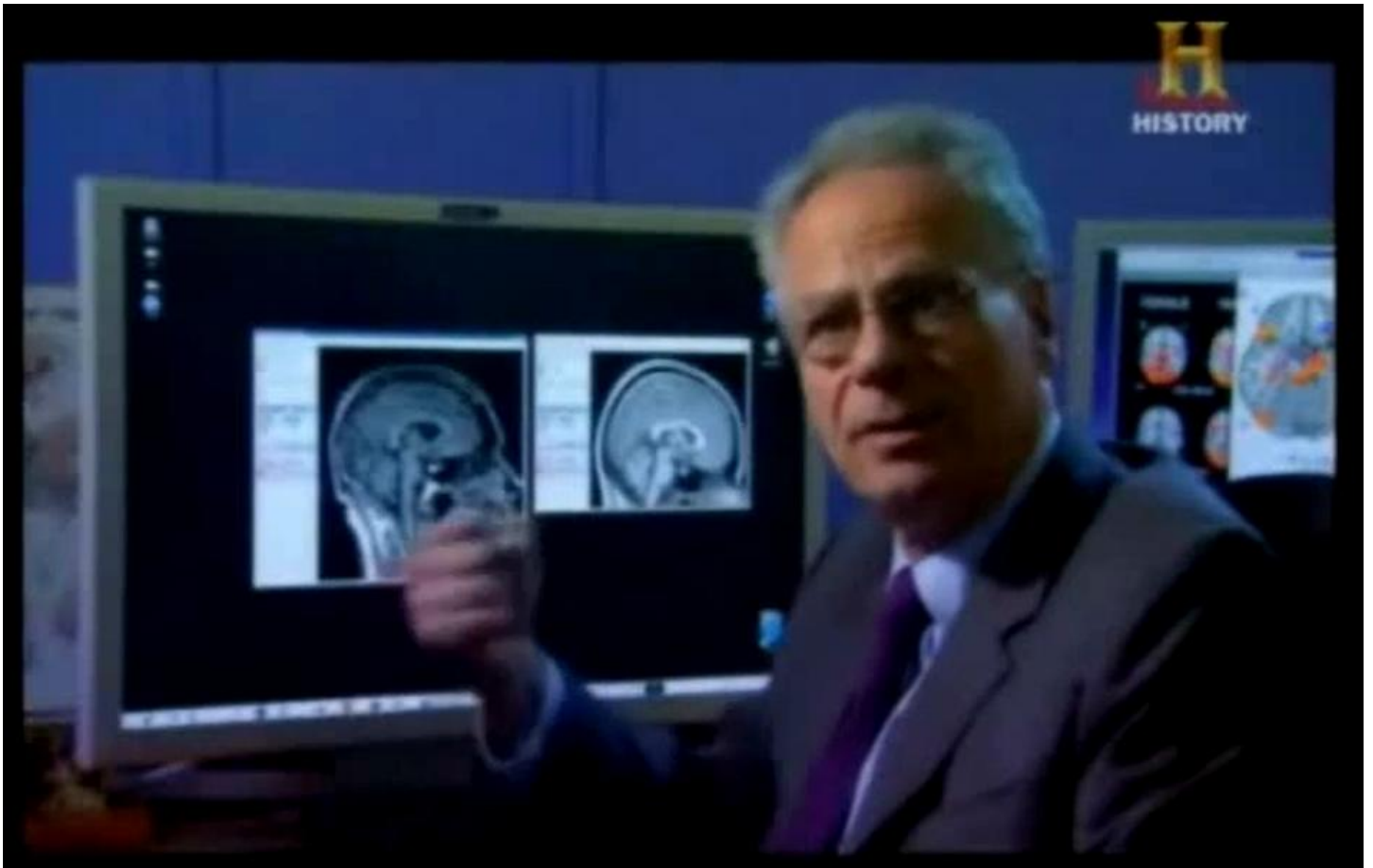
*This area that you can see here in the front is the orbital frontal region, and the orbital frontal regions are like brakes for the Amygdala. If you can think of the Amygdala as being the engine for the threats response, the orbital frontal is the brakes.*



*If Dr. Gur is correct then a person who is overwhelmed by anger is literally temporarily insane until is Amygdala can be control.*



*Case in point the 2003 murder of Betty Dodge by her son James Essick; at the time of the crime, Essick was an adult with mental problems, who had moved in with his mother. Their relationship deteriorated so badly that Dodge asked her son to move out.*



*And that sent him into a panic and he grabbed a sculpture that they had and broke it on her head and kept hitting her repeatedly until she was dead. And then he went across the streets turned himself in to the police.*



*During the court case Dr. Gur was hired as an expert witness and asked to evaluate the mental capacity of Essick. He did a complete neuro scan of his brain and found that 30 to 40% of the tissue was missing in the orbital frontal area.*

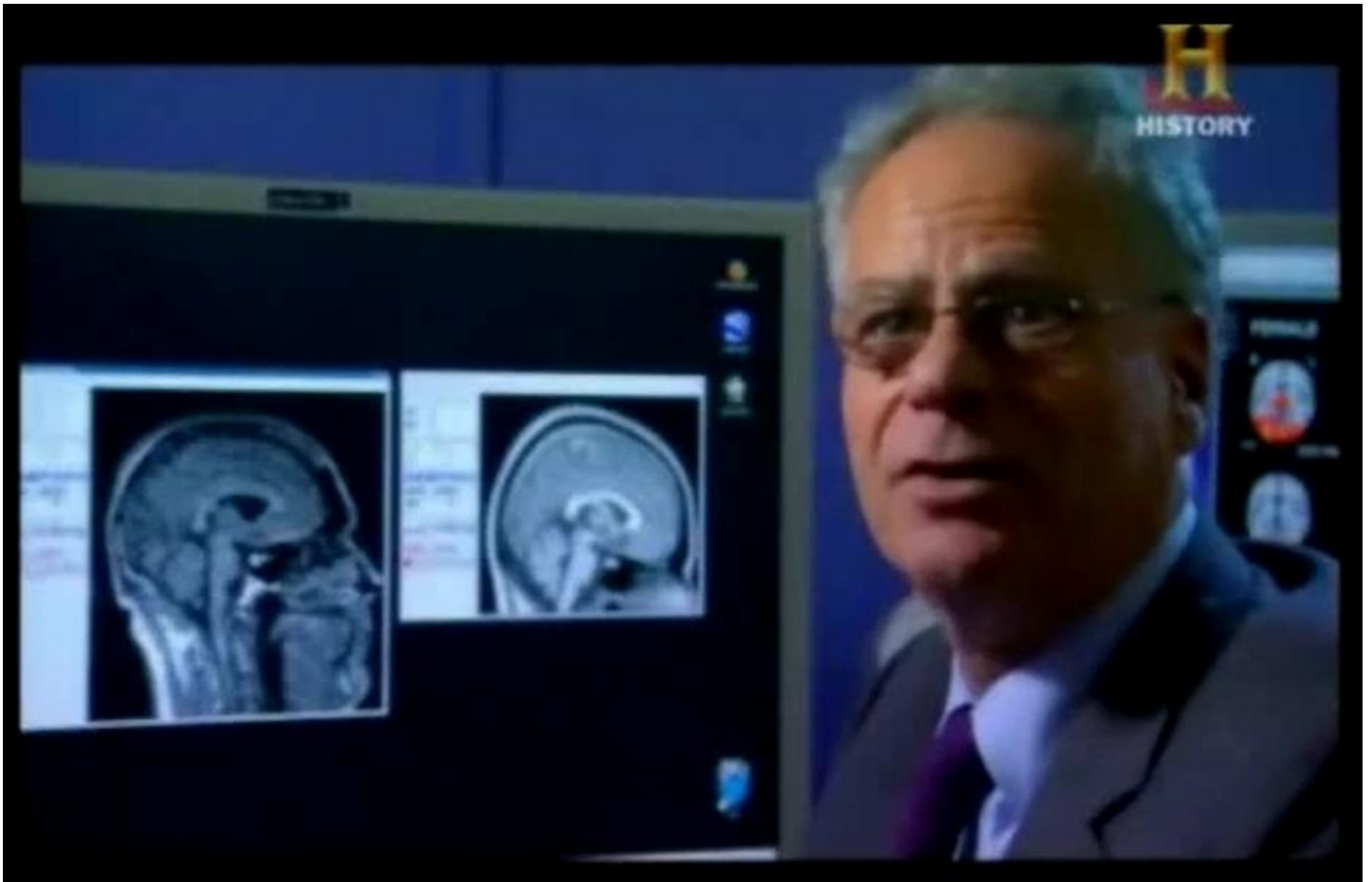


*So when the amygdala was saying, I am in danger, I am furious, attack. There was not enough tissue in the front to say, calm down you have better ways of dealing with this situation than attacking what you think is the source of your fear and anger.*



*The jury agreed with Dr. Gur's testimony and ruled that James Essick was innocent by reason of insanity. He was sent to a mental hospital for treatment. Some might say James Essick was incapable of controlling his ability to sin.*





*The organ of our mind and what controls our behavior is the brain and his brain is damaged.*



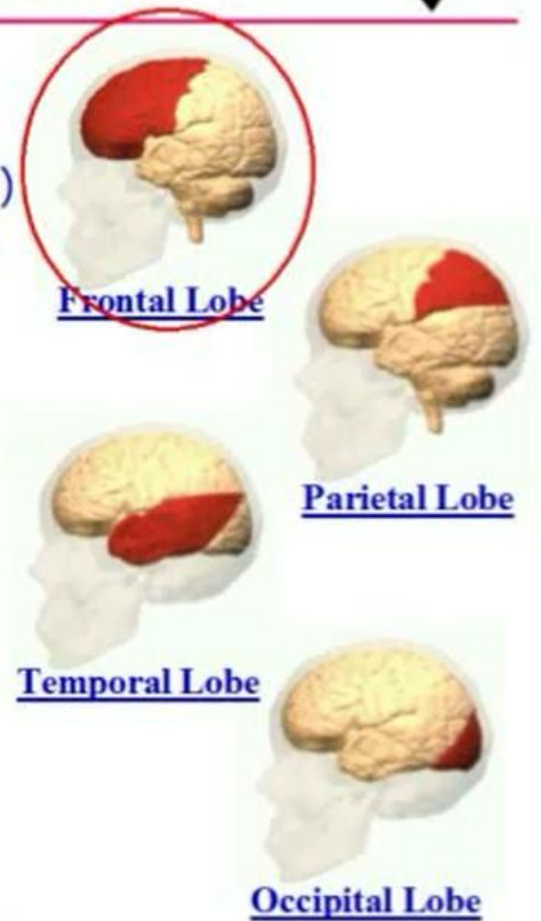
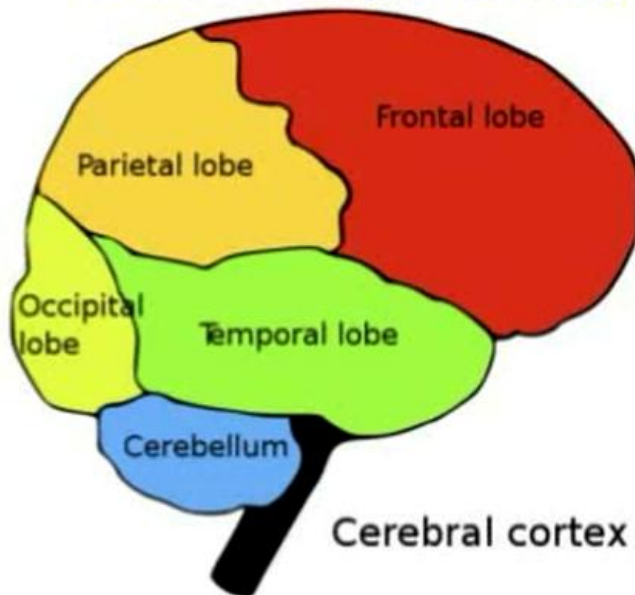
*But by the time an angry act results in prison or a mental hospital, the damage is done. Is there a way to treat human rage before it gets to this critical breaking point?*



# THE LEARNING BRAIN



- ✓ Attention system
- ✓ Logic, Reasoning, Critical thinking
- ✓ Lateral thinking (creativity & innovation)
- ✓ Decision making, Goal setting, Planning



Ven. Dr. M. Punnaaji Maha Thera

CONSCIOUSNESS (October 2011)

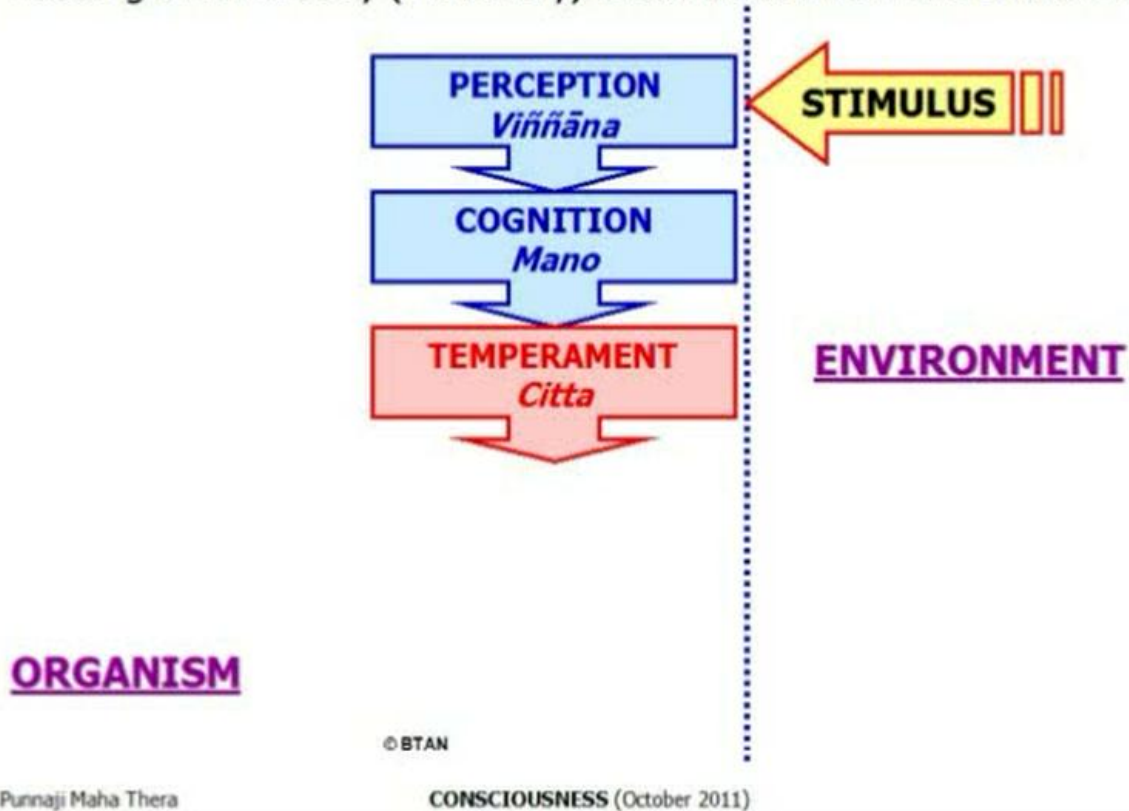
So as you can see the Amygdala is responsible for a lot of our Negative Reactions. So using your frontal lobe is the solution to help yourself to overcome the problems created by the Amygdala. And Bhante has briefly talked about this, so I'll just quickly run through it now.



# STIMULUS-REACTION PROCESS



- In an **untrained mind**, we behave as "Stimulus-Reaction" organisms reacting unconsciously (irrationally) to stimulation from the environment:



When we talk about the reaction to stimulus, Bhante mentioned about this process here, and I put up this process in the form of a drawing. If you look at this in an untrained mind, when I say an untrained mine I mean a normal person, a person who is not well-trained in controlling his mental processes in a top down way. So basically that is most of us here. In an untrained mind, we behave as though we are a stimulus reaction organism that means as soon as there is a stimulus we react. And sometimes this reaction is unconscious and even irrational when we are not aware of the reaction that we actually, how we react to the problem. And very often our reaction also can be quite irrational, illogical.

So when we speak of the environment, the environment has all kinds of things happening: sending stimulus information to our senses, it comes into our Mind and forms some Perception, and then we have the Cognition.

From the Memory, it fetches from Memory to create a much better understanding and interpretation of what has happened.

Then we reach this point where we have temperament. Temperament is basically your state of mind at that moment, your mood.

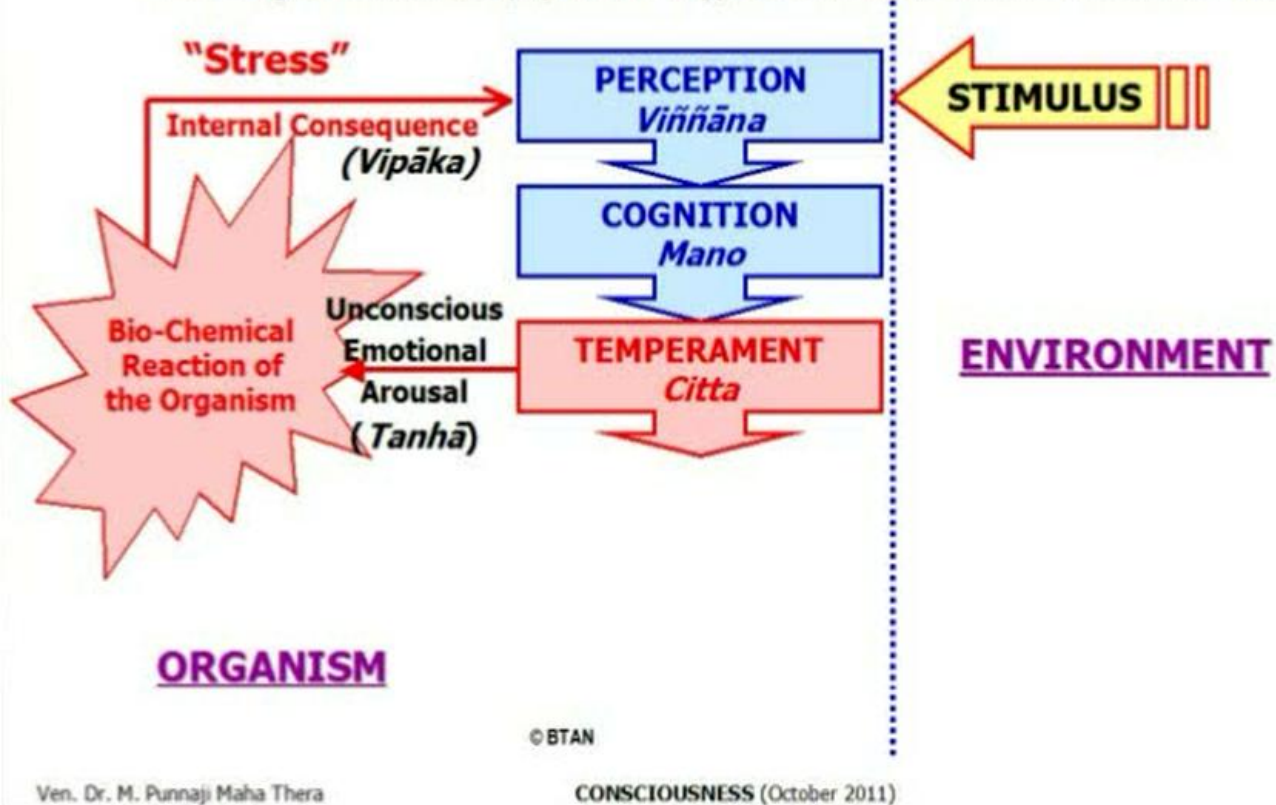
And depending on your temperament whether or not, there is an emotional arousal. So you could experience unconscious, you can experience unconscious Emotional Arousal.



# STIMULUS-REACTION PROCESS



- In an **untrained mind**, we behave as "Stimulus-Reaction" organisms reacting unconsciously (irrationally) to stimulation from the environment:



And then unconscious Emotional Arousal actually triggers the Hypothalamus, which secretes all kinds of biochemical; in another word; it directs the secretion of hormones like Adrenaline and Cortisol, and in some cases if it is a Sensual Pleasure, it may even be Dopamine. So it causes a Biochemical Reaction in your Body and that is then fed back into your Thinking Process. You start to recognize that something is happening in your Body.

Basically Emotion is not something you can put or point your finger to what it is. Emotion is your Biochemical Reaction being detected by you getting that Feeling. So if you're doing something you enjoy the Biochemical Reaction could be a lot of Dopamine flooding through your Body and Dopamine is actually the Pleasurable Hormone. It makes you feel pleasure, and that feeling of pleasure is emotionally high, you get emotional high.

Sometimes it can also be Negative Feelings and things, biochemical reaction that causes you to feel uncomfortable that you feel low, you know, you feel emotionally unhappy. So the Feeling of Emotion is actually very much tied into the Biochemical Reaction in your Body.

Now if you don't control this, what happens is this Biochemical Reaction is going to cause you to “Feel” something, and that Feeling of something comes in as another form of Perception. And this form of Perception causes you to go even further and gets worse, and you can be stuck in a loop. Okay! And when you stuck in a loop, you can't get out of it. If this is the Vicious Cycle you'll become emotionally very hyper-charged, and that is not good for you because chemical, Biochemical Reactions in the Body is not very healthy. Cortisol is one that is very unhealthy. Cortisol actually shuts down your digestive system. Cortisol actually slows down your immune system. It can cause all kinds of diseases as a result.

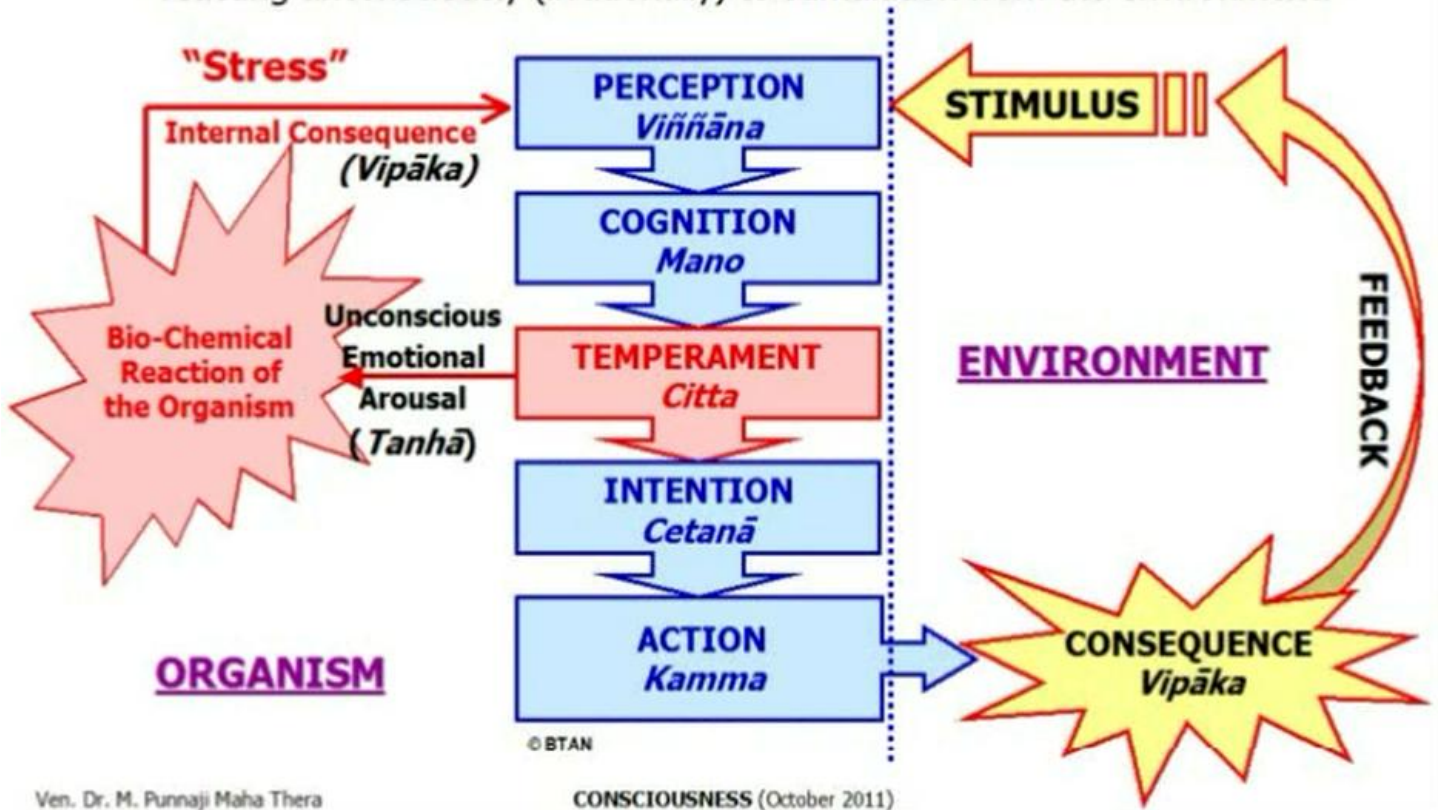
So what you need to do then is to get past the point by maintaining positive temperament, calm down, relax, and then you can get on to thinking about doing something about it.



# STIMULUS-REACTION PROCESS



- In an **untrained mind**, we behave as "Stimulus-Reaction" organisms reacting unconsciously (irrationally) to stimulation from the environment:



Ven. Dr. M. Punjabi Maha Thera

The Intention, "*Cetanā*", and Action then you can change your environment; change something in your environment to bring more peace of mind and happiness into your life.

So basically this is a very quick way of showing this. I will go much deeper into this next week because they are few more things that I need to say about it, but today due to limited time, I will just quickly run through. So up to this point we cover that.





# ANALYZING THE OBJECTIVE EXPERIENCE (**Dhātu**)



**Pathavī dhātu**  
SOLIDITY



**Āpo dhātu**  
FLUIDITY



**Tejo dhātu**  
HEAT



**Vāyo dhātu**  
MOTION



**Ākāsa**  
SPACE



**Viññāṇa**  
PERCEPTION

Ven. Dr. M. Punnaṇa Maha Thera

CONSCIOUSNESS (October 2011)

The Objective Experience; now when we talk about the Objective Experience, Bhante was talking about the properties of what we think as Objects. We think there is something out there, Physical Object, but what it is is like when we “See” something, it is nothing but Reflection of Light into our eye.

And this Reflection is Light falling on to Molecules.

Everything is made up of Molecules.

Molecules are made of Atoms.

So what Atoms are made of?



*The ability to take pictures of molecules and atoms is an incredible thing because only a hundred years ago, the atom was just a theory.*



*At the dawn of the twentieth century it was believed that if atoms existed at all they were either empty shells or solid little balls.*



*Then one investigation changed everything; it was the brainchild of Ernest Rutherford; the Sherlock Holmes of particle physics.*

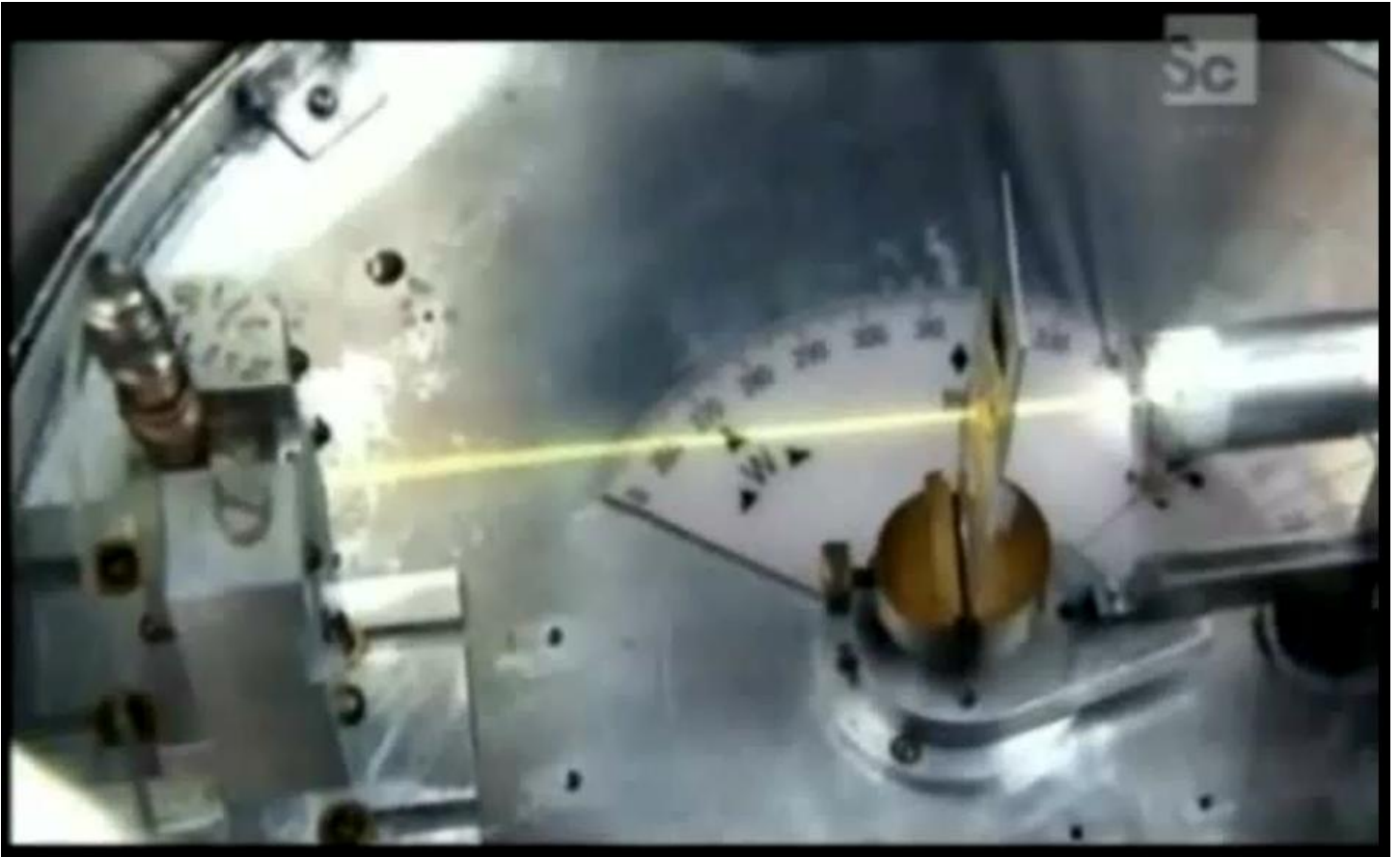




*Steve Nahn is the professor at MIT and a team leader on the world's biggest particle accelerator “The Large Hadron Collider” in Europe.*

*Steve is going to reproduce one of the most important experiments in the history of science, Rutherford's probe into the structure of the atom.*





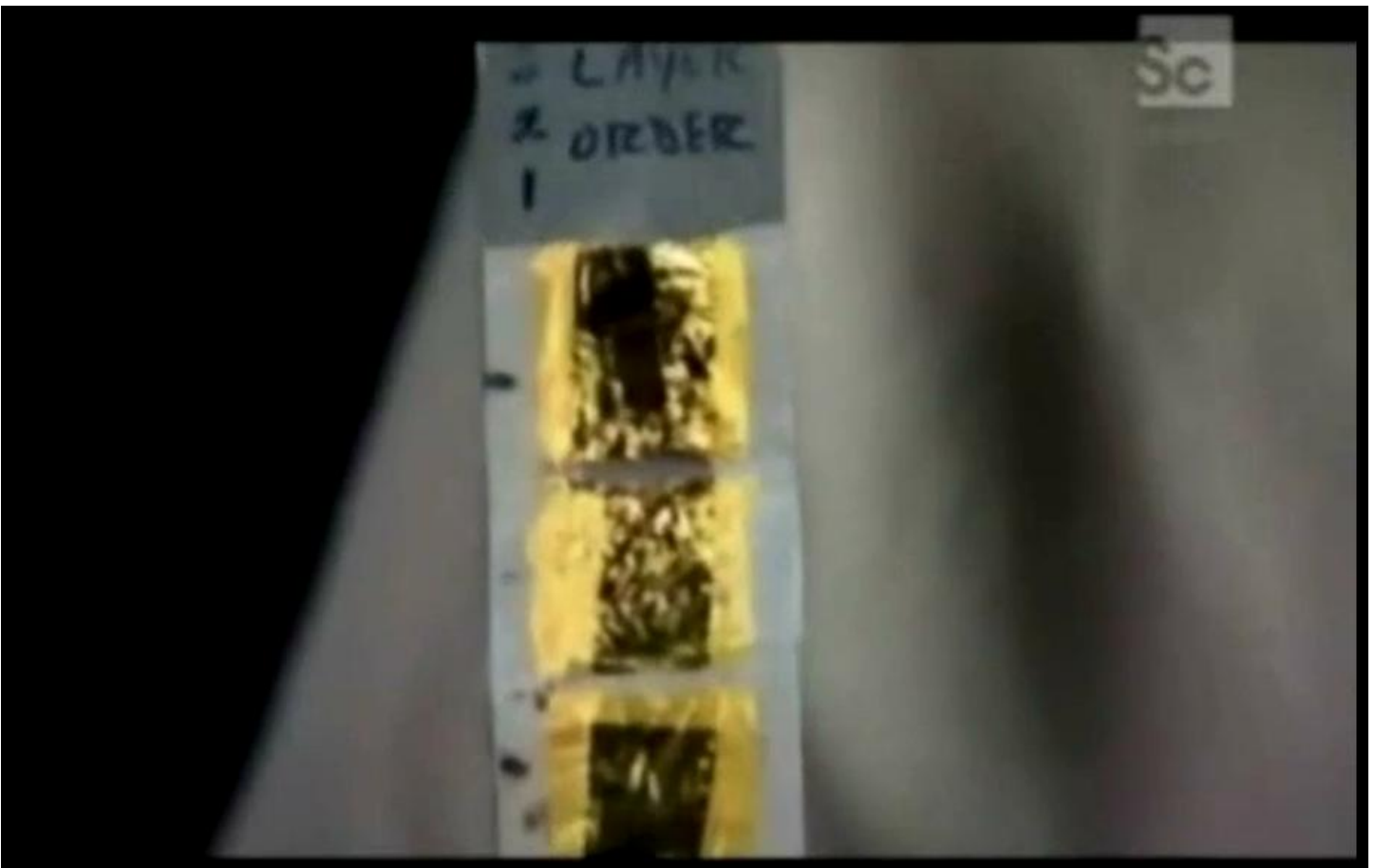
*This experiment is the same as Rutherford's experiment; we use the same kind of gold foils and send millions of particles through these gold foils.*

*Rutherford thought that all the particles would essentially go straight through and not deflect that all, but that's not what happened.*



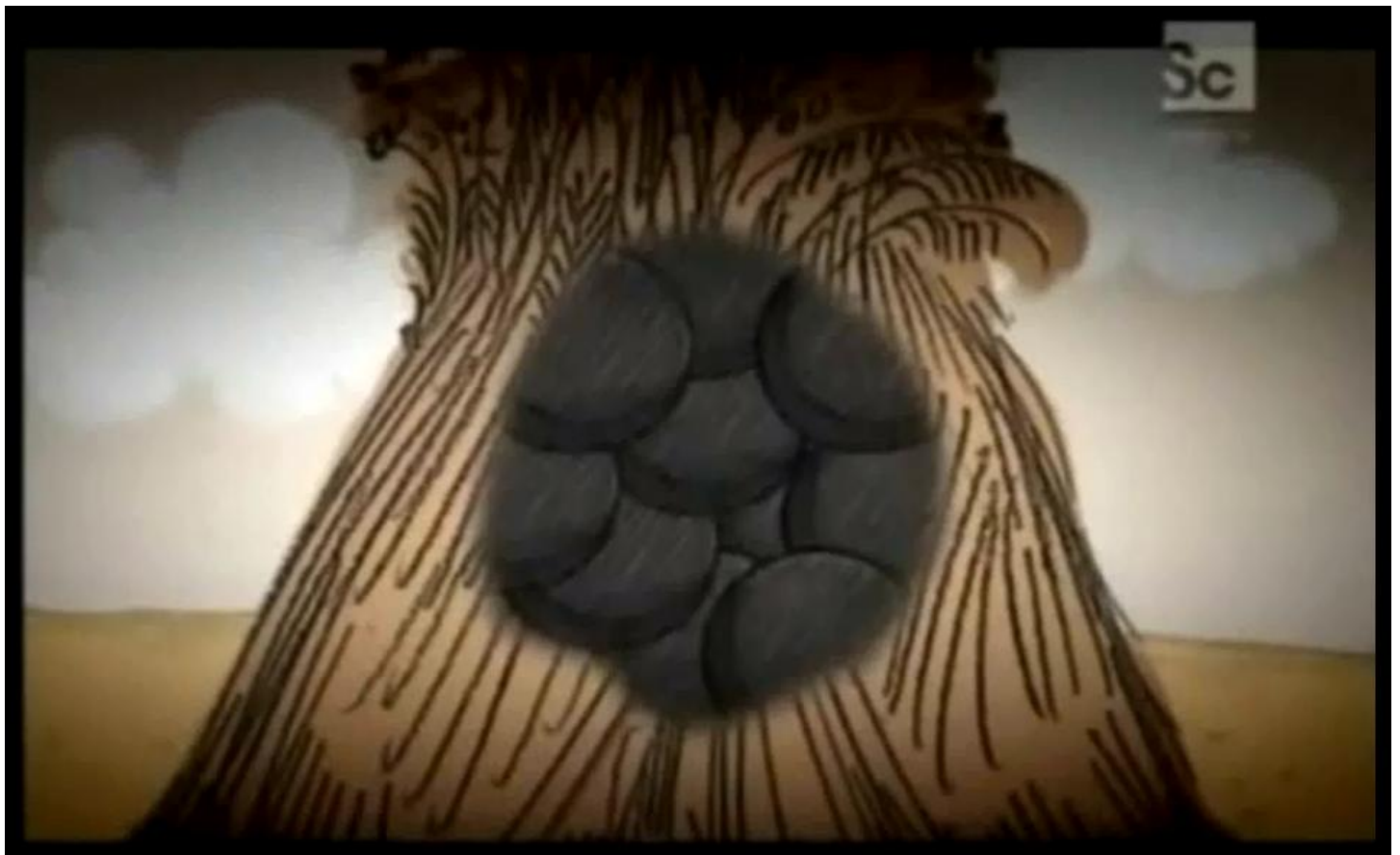


*The Rutherford experiment is like firing bullets at the haystack.*





*The particles like bullets, and the atoms and the gold foil are like haystacks.  
If the haystack is empty, the bullets go straight through.*





*If there are a few cannon balls in the center, some of the bullets will bounce back.*

*And that's what happened.*

*When Rutherford fired his particles, most went straight through, but some sharply bounce back from the center of the target; upending the conceived wisdom of the time.*

*Something small and hard was down in there deep inside the shell of the atom.*



*This is the evidence for very heavy, very small object at the core of the atom; the high-density nucleus surrounded by a vastness of empty space.*

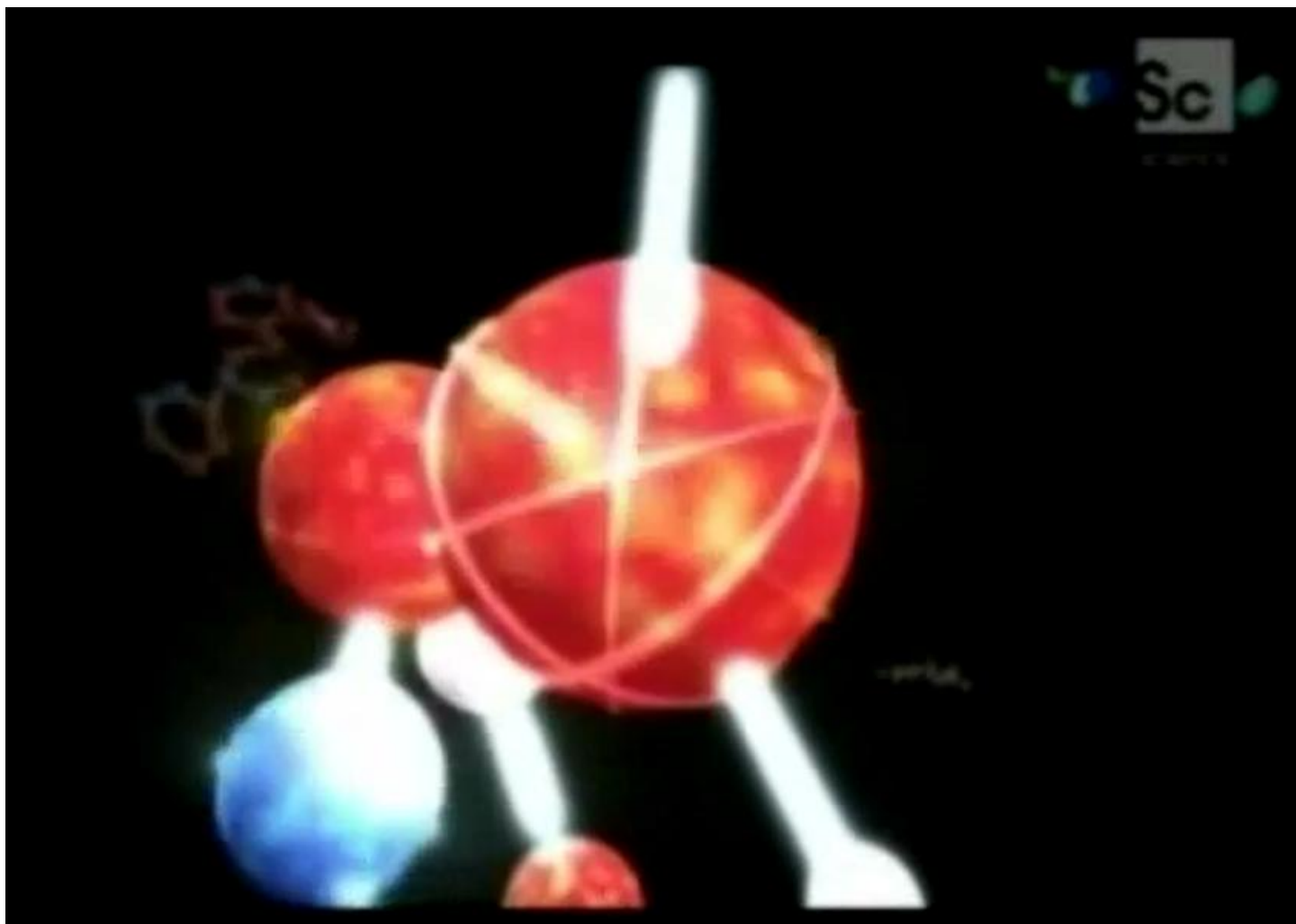


*In fact the nucleus of an atom is 100,000 times smaller than its radius. It's equivalent to the head of a pin in the middle of a football stadium.*

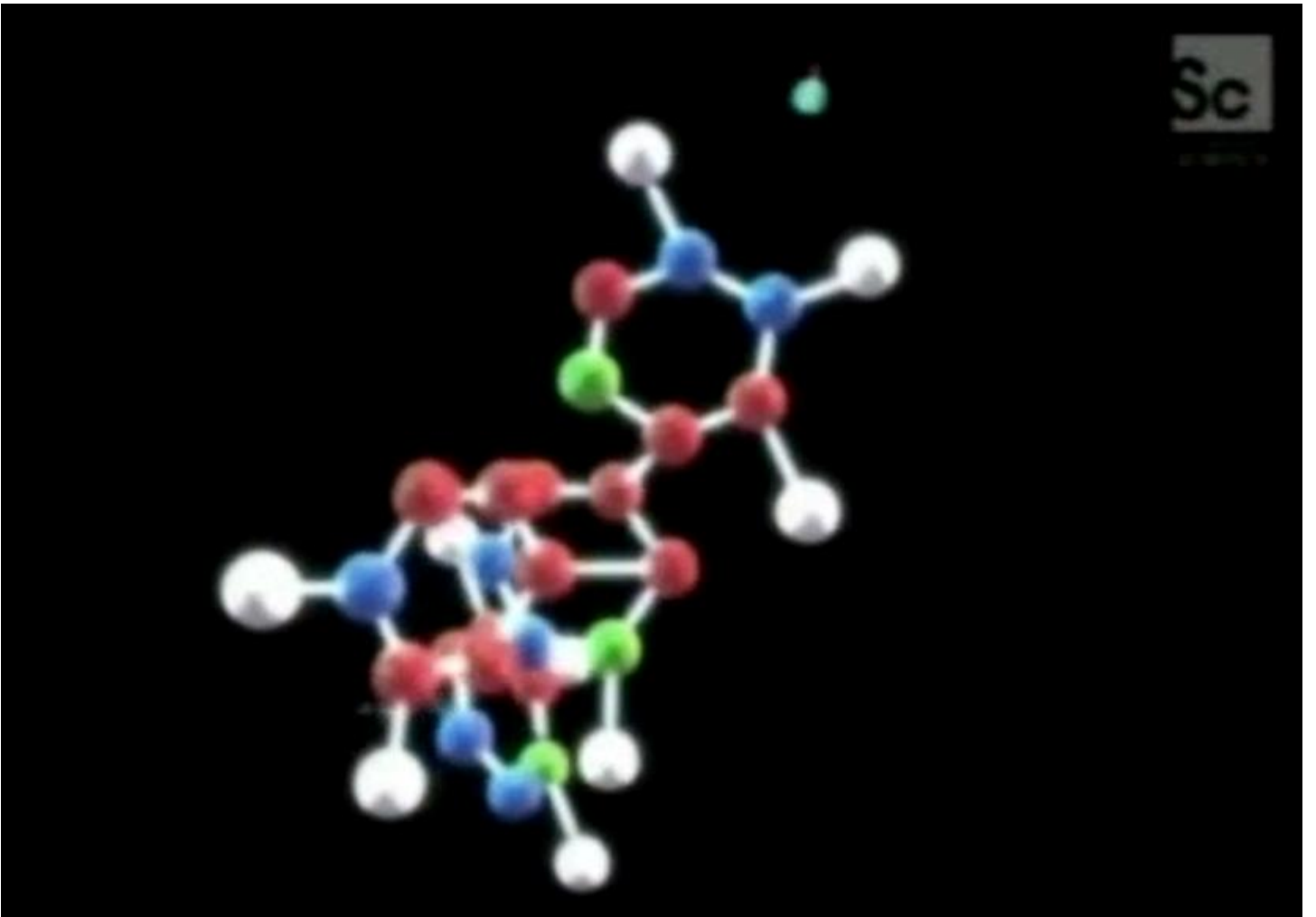


*After Rutherford physicists probe further into the atom. They found that it is built out of three parts: (1) the protons and (2) neutrons that form the nucleus, and (3) the electrons that form the shell around it.*



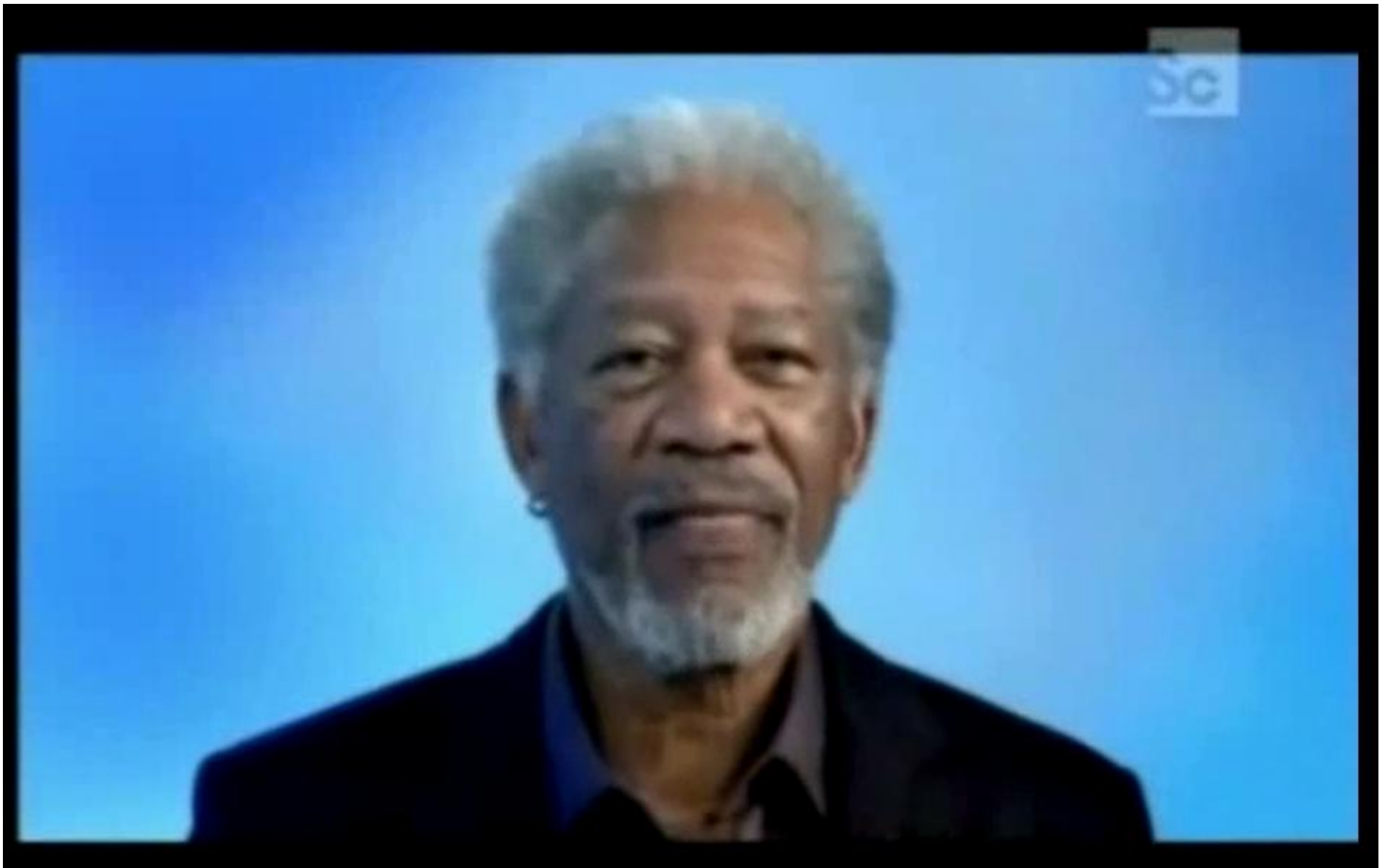


*Between them they make up atoms.*



*Atoms stick together and form molecules.*





*Out of the molecules, we get more complex shapes, from a strand of DNA, up to the seven thousand trillion, trillion atoms that form a human body.*

*For a time, the atomic theory of the universe seemed to explain most everything. But then physicists started breaking atoms apart, and they discovered a slew of mysterious new particles that turned their theories upside down.*



# ANALYZING THE OBJECTIVE EXPERIENCE (**Dhātu**)



**Pathavī dhātu**  
SOLIDITY



**Āpo dhātu**  
FLUIDITY



**Tejo dhātu**  
HEAT



**Vāyo dhātu**  
MOTION



**Ākāsa**  
SPACE



**Viññāṇa**  
PERCEPTION

Ven. Dr. M. Punnaji Maha Thera

CONSCIOUSNESS (October 2011)

So they started breaking Atoms apart.

But if you look at what the Buddha has said, it's quite amazing.

At the core of the Atom is the Nucleus, and there is a part of it that seemed to be solid but surrounded by a vast Empty Space. So and then you have these Electrons going around the Atom. And these Electrons actually carry Energy, and they are vibrating around the Core, the Nucleus of the Atom: Motion, Heat.

So that's very much what was described here by the Buddha is actually very much related to describing what the Atom is made of.

So when they decided to investigate what is inside the Atom, they started to break it apart by breaking down the Nucleus and extracting the Proton.

Then they send protons in opposite direction to crash into each other because proton is so small they can't break it apart. The only way to break it in apart is to have two protons colliding, and when they collide they then break apart as a result of the collision.

And that's how they try to figure out what is inside these subatomic particles.

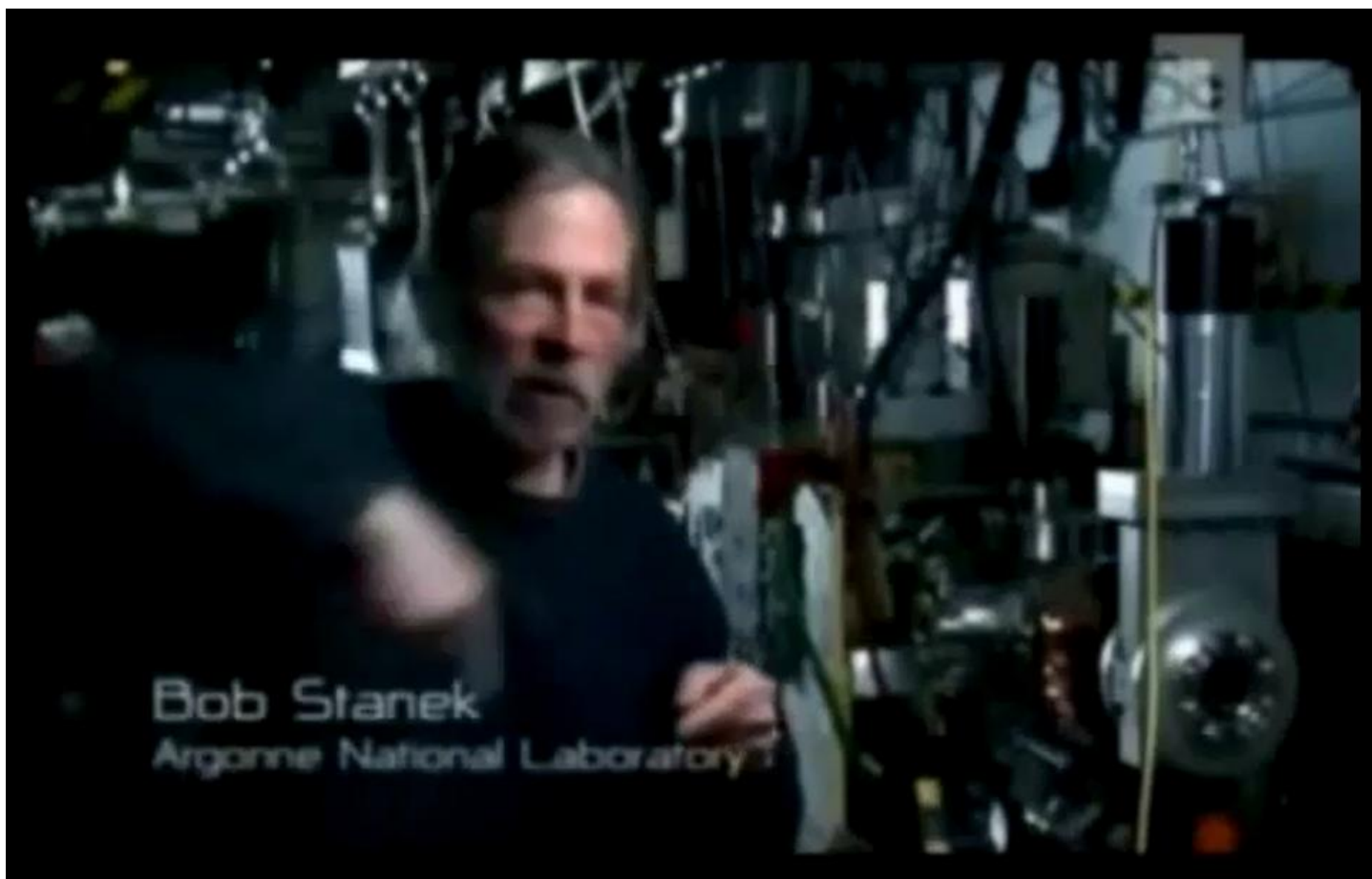


*Particle accelerators like giant microscopes that let us peer into the subatomic World. They break matter down into its smallest components. Drilling down far enough to detect antimatter requires taking proton from an atom's nucleus, trapping them in the vacuum, then shooting them into a ring of giant electromagnets.*

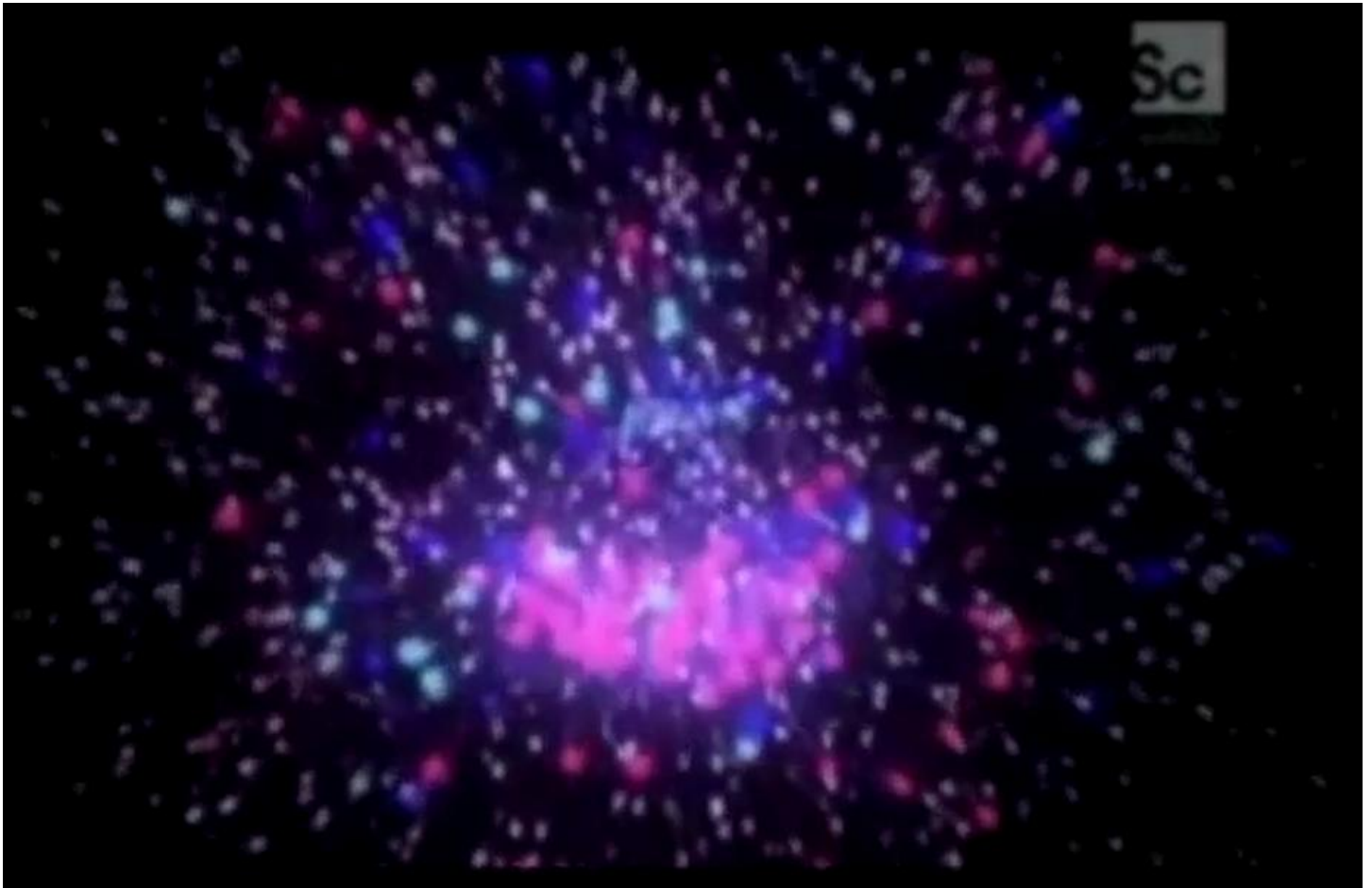


*So a particle accelerator works by starting protons going around in a circle, in a ring, and every time they go around, you give them a little kick with electric field, so they get going faster and faster and faster.*





*So protons in this direction interact with protons in this direction, and at some point they come like a car crashing together. And you can imagine what happens when a car crashes together; pieces fly all over and around that interaction point where the cars crash together is where we have our detector. So this happens millions and millions and millions of times every second.*



*When you break protons apart, you release incredible amount of energy. Strange things come out of the explosions, including tiny particles that flare into existence and disappearing billionth of a second.*



# ANALYZING THE OBJECTIVE EXPERIENCE (**Dhātu**)



**Pathavī dhātu**  
SOLIDITY



**Āpo dhātu**  
FLUIDITY



**Tejo dhātu**  
HEAT



**Vāyo dhātu**  
MOTION



**Ākāsa**  
SPACE



**Viññāṇa**  
PERCEPTION

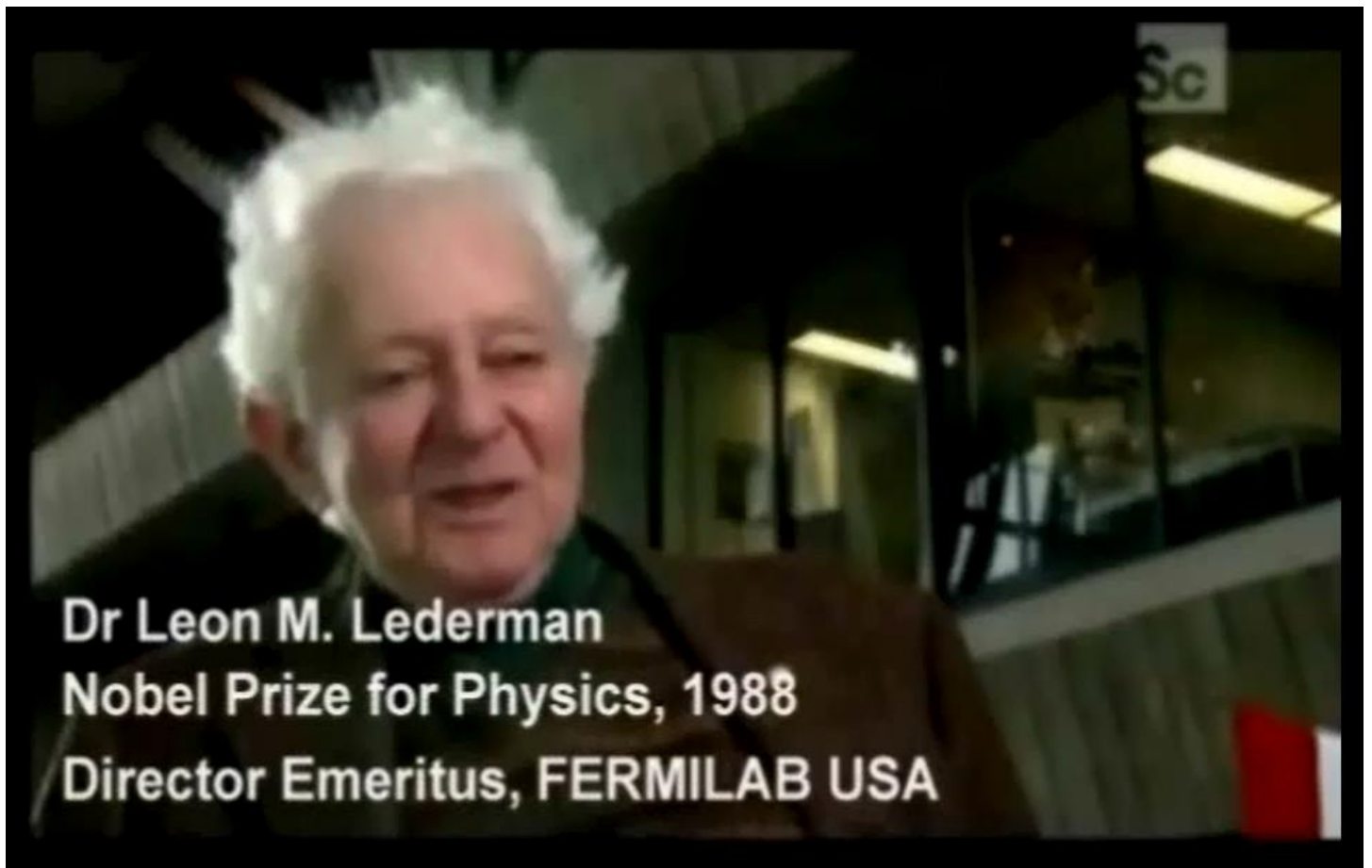
Ven. Dr. M. Punnaṇa Maha Thera

CONSCIOUSNESS (October 2011)

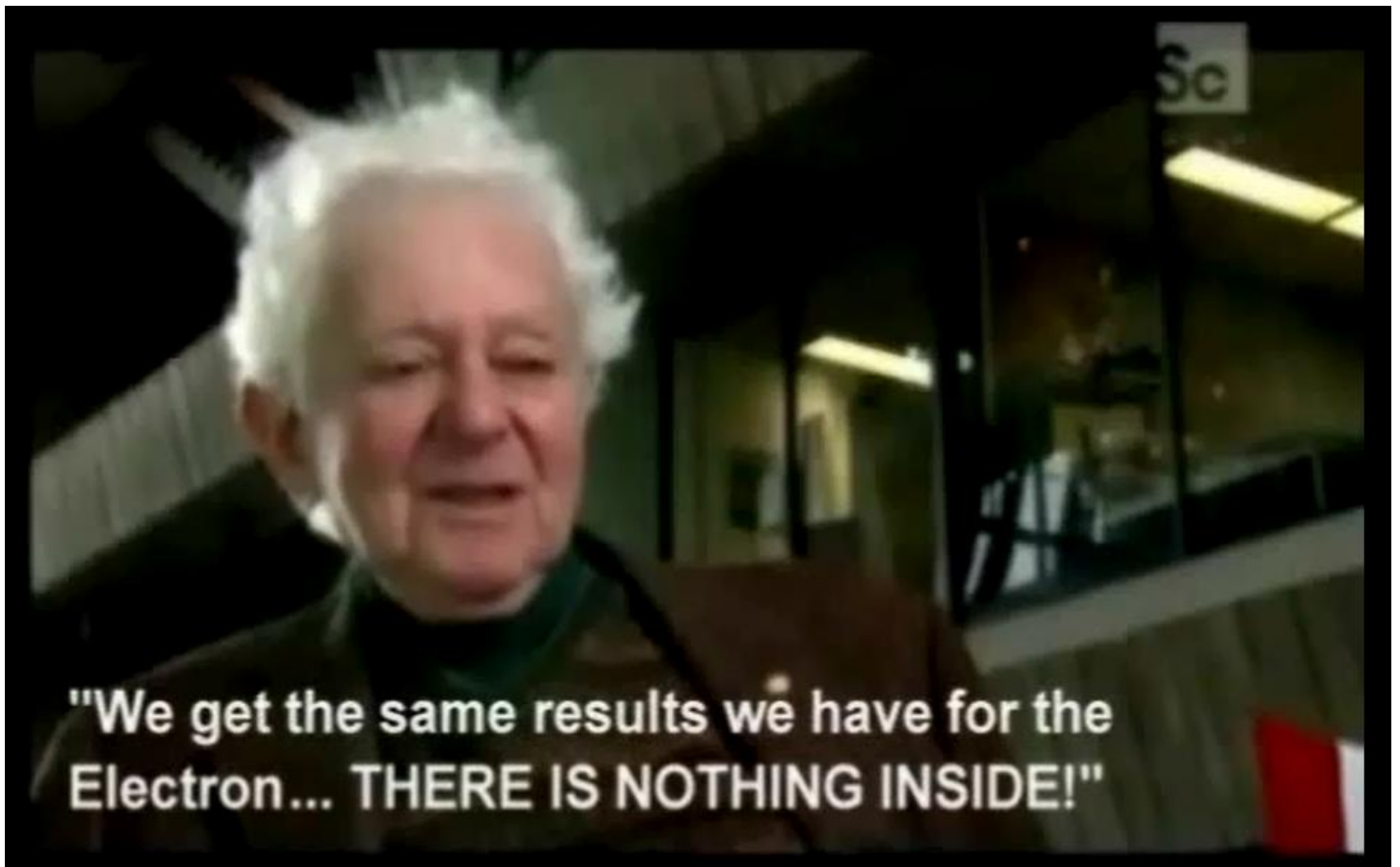
You heard him say that when it breaks apart it is tiny particles that flare into existence and then disappear. Basically they couldn't even figure out what that really is, why it appears and disappears, and it may even appear in two places at the same time. So then they started building these large colliders and dig further investigation to try to figure out what these little things that appear and disappear all about.



*Today after years of reading these subatomic tea leaves, physicists feel they are getting closer to answering the question, what we are really made of.*



*Most of the atoms in our body are made of nuclei and electrons. And the nuclei themselves are made of protons and neutrons. And the protons and neutrons are made of quarks. And of course you say what other quarks made of, and that's where we're stuck. For the last 40, 50 years we've been studying the quarks, try to find something inside, and we get the same results we had for the electron.*



*There's nothing inside; the quarks don't have any size.*

*All matter is actually made of energy that has congealed into particular form. So that appears to be what we are made of.*

Well thank you very much Billy for all these nice pictures that you show and so I hope you all enlightened at least to some extent.